UNITED STATES DISTRICT COURT

DISTRICT OF NEW JERSEY

CIVIL ACTION NO. 83-2864-SA

ANTONIO CIPOLLONE
individually and as
Executor of the Estate
of Rose D. Cipollone,

Plaintiff,

v.

LIGGETT GROUP, INC.,
a Delaware Corporation,
PHILIP MORRIS, INC., a
Virginia Corporation,
and LOEWS THEATERS, INC.,
a New York Corporation,

Defendants.

Deposition of:
RICHARD C.
CLELLAND
12-11-87

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TRANSCRIPT of testimony as taken by and before Kathleen A. Paglione, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, at the offices of Brown & Connery, 360 Haddon Avenue, Westmont, New Jersey, on December 11, 1987, commencing at 9:35 o'clock in the forenoon.

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RICHARD C. CLELLAND, after having been first duly sworn, testified as follows:

EXAMINATION

BY MR. EDELL:

Q. Dr. Clelland, my name is Marc Edell. We introduced ourselves before we started this proceeding. I'm a lawyer. I represent the plaintiff in this case. Your name has been provided to us as an individual who may testify at the time of trial as an expert witness on behalf of the defendants.

I'm going to ask you some questions here today, pursuant to the Deposition Notice and the subpoena which was served upon you. I am sure that you have spoken with at least one of the lawyers representing at least one of the defendants in this case, in preparation for this proceeding, but let me just go over a couple of ground rules so there's no misunderstanding.

If you don't know an answer in response to a question, tell us that, okay?

A. Okay.

Q. If you don't recall a particular fact, tell us that, also.

A. (Witness indicating.)

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Q. If one of my questions is stupid, doesn't make any sense, tell me, and I'll rephrase it. Okay?

A. Okay.

Q. If at any point in time, you want to take a break, let us know and we'll be happy to accommodate you.

A. Thank you.

Q. All right? Let's first find out whether or not my understanding was correct that, in fact, you did meet with at least one of the lawyers involved in this litigation in preparation for this proceeding, is that correct, sir?

A. That is correct.

Q. And tell us about the lawyer or lawyers with whom you met in preparation for this deposition. When did you meet with them, sir?

A. Let's see, a few days ago, we had a meeting with the gentlemen who are on this side of the table, these three gentlemen, and we discussed this particular deposition.

Q. When was the first time you met these three gentlemen. Do you know their names?

A. Yes, that's Mr. Northrip, Mr. O'Neill, and Mr. Decker.

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Q. When was the first time you met with these gentlemen?

A. First time I met with any of them or with all of them?

Q. With any of them, sir.

A. Let's see, it would have been in the summer of 1984 that I first met with Mr. O'Neill. I don't remember exact dates.

Q. Tell us about the circumstances which led you to meet with Mr. O'Neill.

MR. NORTHRIP: Mr. Edell is not asking for substance of the meeting, as I understand the question, but just the location? What do you mean by --

MR. EDELL: Well, I may get to the substance of the meeting.

Q. I want to know what led you to meet with Mr. O'Neill. Was it a phone call, was it a letter? Tell us what happened.

A. There was a phone call from, I think Mr. O'Neill, which said that he and one of his colleagues would like to come and talk to me about the possibility of testifying in some cases.

Q. Who is the colleague to whom he was referring, do you know?

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A. Yes, this is Tony -- I will think of his name in a moment. He also was present at that first meeting. What's Tony's last name?

Q. They won't help you out on this, so don't -

A. I'll think of it after a while. I know it very well.

Q. And where did the meeting take place, sir?

A. In my office at the University of Pennsylvania.

Q. Had you had any prior contact with Mr. O'Neill or anybody else from his firm?

A. I think not.

Q. Had you had any prior contact with any lawyers involved in the tobacco industry?

A. No.

Q. Do you know whether or not your colleague, Dr. Hickey, had prior contact with any lawyers in the tobacco industry?

A. Of my own knowledge?

Q. Or from any knowledge.

A. I really don't know.

Q. You've never heard him tell you that he had contact with any lawyers, is that correct?

A. I don't recall any such information. He may have. I don't know.

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Q. Do you work closely with him on the papers that you publish with him?

A. Dr. Hickey? Indeed. I was co-principal investigator with him some of the time on the research project that led to these papers.

Q. Did he advise you as to who the individuals within the tobacco industry were to whom he reported concerning your work that you did together?

MR. NORTHRIP: Object to the form.

MR. O'NEILL: Object to the form of the question. Assumes there was a reporting.

A. I don't recall any names of individuals. The projects were sponsored by an organization.

Q. What was the name of the organization, sir?

A. It was the tobacco -- Council for Tobacco Research.

Q. Did you have any contact with anybody from the Council for Tobacco Research?

A. No, I've never had any such contact.

Q. Just Dr. Hickey?

A. Pardon?

Q. Just Dr. Hickey, he had contact with people at the Council for Tobacco Research?

A. I believe he had written communications with

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them. I don't know what other contacts he may have had.

Q. Was he the individual in your group who worked on these papers together, who was responsible for maintaining contacts with the Council for Tobacco Research?

A. Yes. Hickey, you see, was full time on these projects, and most of the other people, such as myself, were part time.

Q. Did you see copies of correspondence between Dr. Hickey and representatives of the Council for Tobacco Research?

A. Representatives of -- I saw, and of course, read and signed project proposals each year. I saw letters that came back from the Council for Tobacco Research approving those projects. I don't think I saw other correspondence.

Q. Do you know anything about Dr. Hickey's work with the Shook, Hardy & Bacon firm back in 1980?

A. I don't know to what that refers, to what work that refers.

Q. Do you know whether or not he was working with the Shook, Hardy & Bacon firm back in 1980?

A. No, I do not.

Q. Do you know what Dr. Hickey's usual

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procedure for reporting on the current status of the work that he was performing with you on various projects funded by CTR was?

MR. DECKER: Object to the form.

A. I know that the products produced by the research were sent when completed to the sponsoring group.

MR. NORTHRIP: Excuse me just a moment. We've neglect the Walter's rule. It has something to do with remuneration, a subject that's near and dear to Mr. Northrip's heart.

MS. WALTERS: Doctor, subject to the for Walter's rule, I hand you a check in the amount of $2,000.

THE WITNESS: I'll place it right in this pocket.

(Discussion off the record.)

BY MR. EDELL:

Q. Do you know what contact Dr. Hickey had with Mr. Hardy of the Shook, Hardy & Bacon firm?

A. No, I'm not aware of any such contact.

Q. Are you aware of what contact Dr. Hickey had with Alex Holtzman at Philip Morris?

A. No, I think I am not aware of that.

Q. Do you know what Dr. Hickey's sentiments

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were with regard to the tobacco industry, whether he favored the tobacco industry or not?

MR. DECKER: Object to the form of the question.

MR. NORTHRIP: Join in the objection to form.

A. I really can't speak for Dr. Hickey.

Q. You never had any conversations with him in that regard?

A. In which regard?

Q. In regard to his feelings about the tobacco industry?

A. I had lots of conversations with him about the research, but --

Q. You never had a conversation --

A. I don't know what you mean by his feelings about the tobacco industry. That's kind of vague.

Q. Well, whether or not he liked the tobacco industry, whether he felt that they were given the raw end of a deal on this issue of cigarette smoking and health, subjects like that, sir.

MR. NORTHRIP: I object to the form, and also the speculative nature in the request of what did Dr. Hickey feel. You may answer.

A. I just hesitate to say that I know what Dr.

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Hickey's sentiments are.

Q. I don't ask you -- I'm not asking you to define what they may be, sir. I'm asking whether or not you had any conversations with him in which he conveyed his feelings or his stated feelings concerning the tobacco industry to you.

A. Well, I don't recall any specific conversations of that sort. I've had hundreds of conversations with Dr. Hickey over many years, and we certainly talked about the research activities and a whole lot of aspects of the research as routinely part of these conversations.

I don't recall specific conversations in which Dr. Hickey said, I very much like the tobacco industry or I very much hate the tobacco industry or those sorts of conversations. I really don't.

Q. Let's avoid, then, the specifics of a particular conversation.

Over the number of years that you worked with Dr. Hickey on projects funded by the Council for Tobacco Research, did you gain an impression from your conversations with him concerning his feelings towards the tobacco industry?

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MR. DECKER: Object to the form of the question.

MR. NORTHRIP: I join.

A. Well, the Council for Tobacco Research was one of the sponsors of these research projects, indeed, a principal sponsor, and it's perfectly clear that one in conducting research projects is pleased when one is sponsored. So I think he felt favorably toward the Council for Tobacco Research as a sponsor, but what more can I say?

Q. As much as you know, that's how much more you can say.

A. Well, I don't think I know anything else that is relevant here.

Q. Was it your feeling, sir, that Dr. Hickey was unbiased in terms of his feelings towards the tobacco industry?

MR. DECKER: Objection to the form of the question.

MR. NORTHRIP: I join.

A. Oh, yes, I don't -- I really hesitate to represent Dr. Hickey's feelings. It is my -- it is certainly my feeling that in the conduct of the research, which he and I carried out, he took a proper scientific attitude and that the research

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has not had built-in biases.

Q. What expertise did Dr. Hickey have that does not have built-in biases?

A. Dr. Hickey has a Ph.D. in chemistry and had a good deal of experience in areas of -- various areas of biology.

Q. And what training do you have which permitted you to determine the objectiveness of his work on these papers in those specific areas?

A. I have -- I am trained, of course, in statistics, and I have no deep knowledge of biology, certainly, and those areas. I -- my comment here would be that I saw nothing to indicate to me Dr. Hickey's work was other than properly scientific.

Q. What training do you have in biology, sir?

A. I have no training in biology.

Q. What training do you have in chemistry?

A. I have no training in chemistry.

Q. What training do you have in any of the fields in which Dr. Hickey is an expert?

A. If, by those fields, you mean biology and chemistry, I've answered that, I am not trained in those fields.

Q. Was there any separation of responsibility

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on the work that you performed with Dr. Hickey in terms of biology, chemistry and statistics?

A. Well, let me try to answer this in the following way.

Q. Okay.

A. It is perfectly clear that the matters of statistics, which is my primary realm of expertise, I would have the last word in questions arising in the research.

It is also true that in matters related to biology, Dr. Hickey and Dr. Bowers would be the primary persons in terms of expertise. Dr. Bowers is trained in anthropology and genetics and general biology.

Q. What training does Dr. Hickey have in pharmacology?

A. I really don't know.

Q. Who was responsible for drafting the manuscripts of the papers which you published as a result of the funding that you received from the Council for Tobacco Research?

MR. DECKER: I object to the question, I think there were multiple papers.

MR. EDELL: Then we can talk about every one of them if it changed.

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MR. NORTHRIP: Also, I object to the form in that it says that the funds that you received from the Council for Tobacco Research. I don't think there's been any testimony that Dr. Clelland received any funds.

BY MR. EDELL:

Q. You can answer the question, sir.

A. Want to rephrase it again, after these --

Q. No.

A. Could we repeat it?

(The record is read back.)

A. The original draft would have been written by various people on the project, and in general, and there could be some exceptions to this, in general, all those publications were read, redrafted and put out after all the principals had worked them over.

Q. Would you be able to tell me if we went through the list of publications, sir, who was responsible for the initial draft of the manuscript?

A. I probably could in some cases, but remember, you're talking 15-20 years ago in some other cases, so I -- I'll try, if you'd like to do that, but --

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Q. Sure.
A. -- I may not be able to.
Q. Do you have a copy of your curriculum vitae with you, sir?
A. No, I don't.
MR. EDELL: Let's mark this for identification.
(Exhibit Clelland 1 marked for identification.)
BY MR. EDELL:
Q. Dr. Clelland, you have before you Clelland 1 for identification, sir?
A. Yes, indeed.
Q. Can you tell us what that is?
A. This is a copy of my resume'.
Q. Does your resume' contain a listing of all the publications which you've participated in, which were funded by the Council for Tobacco Research?
A. I believe so. Certainly all the principal publications.
Q. What do you mean by principal publications?
A. Well, there could have been some three page reports, some minimal sort that went in there, or there could have been some interim reports, but

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certainly, this is the list of the main publications.

Q. Why don't we go through them, sir, and tell me, if you can, who was the individual participating in those reports who prepared the initial draft of the papers.

A. All right. Where would you like me to start?

Q. Start at the beginning.

A. You mean -- well, you mean back to item one, which is not anything to do with these projects.

Q. No, we're talking about the reports funded at least in part by the Council for Tobacco Research.

A. All right, let me see if I can identify those. Now, item nine, which you see there, which Dr. Hickey was a co-author of mine, was not funded by the Council for Tobacco Research, as I recall. That seems to be the first one on which Richard Hickey's name appears.

Q. Who wrote that paper, sir?

MR. NORTHRIP: You're asking even though it wasn't funded by --

MR. EDELL: Sure, we're talking about it, so we might as well find out about it.

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A. That was a joint effort of the three authors, and Dr. Woodbury was perhaps the principal author of that.

Now, going down this list, here we see item 12, R. J. Hickey and E. P. Schoff. Now, I am not sure whether or not that was funded in any way through the Council for Tobacco Research. That's one of these early publications. That is something on which Dr. Hickey did the first draft, but I don't know how it fits in with funding from the Council.

13, the I triple E transactions. Now, that was the first paper where we showed our regression work in the air pollution area. Now, I think it's fair to say that Dr. Hickey and I jointly prepared the first draft. He might have done half of it and I might have done half of it, as I recall.

Q. What half did he do and what half did you do?

A. I would have done the statistical part in the regression cases.

Now, this next one, this is the Regional Science Research Institute paper. That --

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MS. WALTERS: What number is that?

THE WITNESS: That's 14.

A. And probably Dr. Boyce would have been the principal author of that. Dr. Boyce is a member of the Regional Science Department and very active on the project in its early years, and he probably did the first draft of that, but I'm not sure.

16, that's Exploratory Ecological Studies, that is sort of a compendium of a variety of work that went on. We put that together more or less as a reference document. And probably Dr. Hickey would have done most of the original draft of that, but not all. It has various sections and sort of a summary.

So he would have probably done the first draft and more than half of that.

Item 20, that is something that Dr. Hickey -- now, E. Harner is the same person as Dr. Bowers. This is a --

Q. She is married?

A. She is married and divorced, and then went back to her former name. That would have been done by Dr. Hickey and Dr. Bowers, first draft.

This Chapter 11 in Barry B. and Horton was essentially a repeat of parts of the I triple

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E paper, basically. So that refers back to 13.

I'm remembering more of this than I thought I would. Carbon Monoxide, Smoking and Constitution, Hickey, Boyce and Harner, The Lancet. That's a short item that would have been Hickey and Harner, primarily.

MS. WALTERS: What number is that?

THE WITNESS: 23.

A. And the same on 24. Hickey and Harner in some combination would have done that first draft.

27, Hickey, Bowers and Boyce, Archives of Environmental Health, that one, we would have had -- that one, I really don't know who did the first draft. I better just pass on that one.

28, again, I do not know who did the first draft on 28. 30, Hickey would have done the first draft.

Maternal Smoking, number 33, as I recall, that was one that was passed around a great deal, and I would say all three authors probably did an original draft of that in various pieces. I think so.

Essential Hormones, 35, I think that has to be attributed first draft to Hickey and

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Bowers in some combination. I don't know what the combination would be. I don't remember.

37, Epidemiological Studies of Chronic Disease, I did the first draft.

38, Low Level Ionizing Radiation, and Human Mortality, that was a joint effort, and I think probably parts of the first draft would have been done by Hickey, Bowers and myself. I think that's true.

Dietary Nitrate was something where I did the first draft.

MS. WALTERS: What's the number of that?

THE WITNESS: 39.

A. 40, Review of Sulfur Oxides, A. B. Clelland did the first draft.

41, Bias of Selective Reporting, I did the first draft.

Radiation Hormesis, Hickey did the first draft.

Biosocial Factors in Infant Mortality, Bowers did the first draft.

MS. WALTERS: Is that 42?

THE WITNESS: That's 43. 42 was radiation hormesis.

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A. That's, to the best of my knowledge, at this point, and I think as I go through them, I'm fairly accurate. Maybe not completely.

Q. Did you receive any consulting fees for the work performed on any of these papers?

A. No, none.

Q. Have you ever received any consulting fees from the tobacco companies for any work that you performed regarding any papers written by Dr. Hickey?

A. No.

Q. Did you receive any funds in any form from this Council for Tobacco Research or from the cigarette manufacturers?

A. Me as an individual? No. You understand that these were contracts -- done under contracts submitted to the University of Pennsylvania, and the University of Pennsylvania received money from the Council, and out of that, a small part of my salary would have been paid during the years I worked on the projects. It did not result in any increase in salary to me. I never received any consulting fees whatever.

Q. Were you ever advised that the Scientific Advisory Board was not going to renew any of the

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grant proposals that you were working on?

A. Was I ever advised? No, I was not.

Q. Did the Scientific Advisory Board of the Council for Tobacco Research ever fail to renew any of the grants that you were working on?

A. As far as I know, the Council for Tobacco Research reviewed these up until the time Dr. Hickey retired.

Q. And in each instance, the renewal was approved, is that correct?

A. Must have been.

Q. I'm sorry, sir?

A. It must have been, because the grants came through. I don't know any details about Scientific Advisory Board or otherwise.

Q. Were you ever advised that the Scientific Advisory Board was not going to fund or fund the continuation of any of the grants, and that counsel for Philip Morris had to intervene in order to get approval for the renewal of those grants?

A. No, I have never had any communication --

MR. NORTHRIP: Object to form.

A. -- with the Council for Tobacco Research, you see.

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Q. And Dr. Hickey never told you about that, is that correct, sir?

A. I don't know whether it's a fact or not. I've never -- I never heard that before.

Q. And Dr. Hickey never told you about his correspondence with Mr. Holtzman of the Legal Department of Philip Morris, is that right?

A. Right.

Q. And he never told you about his correspondence with Mr. Hardy at the Shook, Hardy & Bacon firm?

A. Right. I am not aware of any correspondence to either of those gentlemen.

Q. After Dr. Hickey retired, did you submit any grant proposals to the Council for Tobacco Research?

A. No, I did not.

Q. Do you intend to, sir?

A. Who knows. I certainly don't intend to at present. A year from now, who would know.

Q. What is Dr. Hickey doing now?

A. Dr. Hickey is in retirement, and I don't know a great deal about what he is doing.

Q. Where does he live, sir?

A. He lives in Havertown, Pennsylvania.

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Q. Do you know whether he's doing any consultant work with the tobacco industry?

A. Let me think. I think he is doing something with the tobacco industry, but I don't know any details.

Q. What leads you to that belief, sir?

A. I've had conversations with him where, as I recall, he mentioned that he was doing something with the tobacco industry.

Q. When did these conversations take place?

A. I see Dr. Hickey, oh, maybe once every three weeks or so. He drops in my office and says hello. You asked me about his activities.

He, this fall, attended a conference in Austria on low level radiation. That, I know. Outside of that, I don't know much about what he is doing.

Q. Did you discuss with him your participation in this case as an expert witness?

A. Not at all.

Q. Were you instructed not to?

A. No.

Q. Sir, are you an epidemiologist?

A. What do you mean by an epidemiologist? Or should I try to define that?

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Q. Well, let me ask you this, are there people at the University of Pennsylvania who are epidemiologists?

A. Yes.

Q. And who are they, sir?

A. There are a couple of people in the medical school that run a program in clinical epidemiology, Master's program, and I will think of names if I think long enough, but I don't recall them at this point.

Q. Did any of those epidemiologists participate in any of the studies funded by the Council for Tobacco Research which you participated in?

A. No.

MR. DECKER: Object to the form of the question.

A. But they did not so participate.

MR. NORTHRIP: To avoid time, if one of us objects to the form, can that be considered objection for all?

MR. EDELL: As always.

BY MR. EDELL:

Q. What is an epidemiologist, sir?

A. You're asking me to define it?

Q. Yes, please.

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A. Well, let's try it this way. I think most people would say that epidemiology was the study of disease or other ills in populations, and I would suppose a reasonable definition of an epidemiologist was a person who engaged in those sorts of studies.

On the other hand, there are persons who would not call them epidemiologists, who do that sort of work, also. So I think the definition is somewhat fuzzy.

Q. Well, are there other professors in epidemiology at the University of Pennsylvania?

A. The people who conduct the program in clinical epidemiology are in the Department of Medicine of the School of Medicine. I don't know at this point whether epidemiology is in their title. I think they are Associate Professors or Professors of Medicine, but I could be wrong about that.

Q. Have you ever participated in an epidemiology study with an epidemiologist?

A. Well, again, that depends on how you define epidemiologist.

I have been doing work which many people would consider epidemiology work for years

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in these projects we've been talking about. Now, I don't consider myself an epidemiologist, but I have certainly had some experience in work that many people would consider epidemiology.

Q. You're an expert in statistics, right, sir?

A. Yes.

Q. And define what you mean by statistics.

A. Well, these definitions can be given differently by different people. I would define statistics as the science of obtaining information from data. And it comes in two parts, a theoretical part, in which methods, largely mathematical methods, are derived as a basis for dealing with data, and then a practical aspect, which deals with the actual acquisition and analysis of data.

Again, other people would give you different definitions, I'm sure.

Q. Well, is there any description of statistics that's commonly used in the Statistics Department at the University of Pennsylvania?

A. You mean a written description?

Q. Yes.

A. I'm not aware of a written description, but I think the definition I gave you would be agreed

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to by most members of the department, at least.
Q. Now, you're in the Wharton School, is that correct?
A. Um-hum, that's true.
Q. Is that the business school?
A. It is.
Q. There is a medical school at the University of Pennsylvania, is that correct, sir?
A. There is.
Q. And there are people at the medical school who conduct research in the area of epidemiology, is that correct?
A. I don't know whether it's correct or not. I don't think there's much epidemiological research in the medical school.
Q. Is there a School of Public Health?
A. No.
Q. Wharton has done other work for the tobacco industry, hasn't it, other than the work funded by you -- funded by the Council for Tobacco Research that you and Dr. Hickey performed, isn't that right?
A. I can think of one study performed by the -- by one of the other research groups in the school.
Q. And what study is that, sir?

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A. It was a study I've seen having to do with economics of some sort.
Q. Again, that's in the business school, right, at Wharton?
A. Yes.
Q. Can you tell us what you know about that study?
A. I've scanned it at one time or another. I don't remember much about it at all. It had to do with the economics of smoking cost benefits, as I recall.
Q. When was that performed, do you know, sir?
A. I don't know.
Q. Do you know for what period of time it was performed?
A. No, I know little about it. I've seen it.
Q. Do you know who participated in the study?
A. I think it was done by the -- the individuals? No, I don't. But I think it was done by something called the Wharton Applied Research Center, and possibly the Wharton Economic Forecast -- I think the Wharton Economic Forecasting Unit also participated in that.
That, although it carries the name Wharton School, is a group that is outside the

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University of Pennsylvania. It's not part of the university at all.

Q. Is it your testimony that the study performed by the tobacco industry was not performed through the Wharton School at the University of Pennsylvania?

A. No.

MR. DECKER: Object to the form of the question.

A. No. It's my testimony that as I recall, it was performed by two organizations, one, the Wharton Applied Research Center, which is in the Wharton School at the university, and one by the Wharton Economic Forecasting Unit, which is organized outside the university.

Q. Is it important for you as a professor to obtain research grants to perform research?

A. At the present time?

Q. At all during your career?

A. It has not been, during my career, particularly important.

Q. Have you ever done any consulting work for any businesses, sir?

A. Yes.

Q. What businesses?

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A. Oh my goodness, quite a few. Let me see what I can recall. I'm doing some consulting work presently for the Metropolitan Life Insurance Company.

I have done consulting work for Haskins & Sells, the accounting firm. I've done consulting work for the Book of the Month Club. Some of these go way back. Let's see. I've done consulting work for Anheuser-Busch at one point. I've done consulting work for Merck, Sharp & Dohme, pharmaceutical company.

Is that a reasonable number? There are more, but that's what I think of at the moment.

Q. What work did you do for Met Life and what work are you doing for Met Life?

A. Met Life, we're looking at various incentives for improving the productivity of insurance agents. I'm involved in that because there is a question of design of the experiment that's to be performed.

Q. Does that involve epidemiology?

A. No.

Q. What work did you do for -- was it an accounting firm?

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A. Haskins & Sells.

Q. What work did you do for this accounting firm?

A. Well, that accounting firm was engaged in advising the State of New Jersey in connection with the first implementation of DRGs in hospitals of the State of New Jersey, and I was to give statistical advice on the DRG system.

Q. Excuse my ignorance --

A. DRG, this is the diagnostic related groups, which are the basis for Federal Government and others cost control efforts in hospitals.

New Jersey was the first trial of that some years ago, and that was a very interesting project.

Q. And did that deal with epidemiology?

A. No, it did not deal with epidemiology. On that particular question, I think the only work I've done that deals with epidemiology is the work that you know about, with these projects that we've been talking about.

Q. When you say these projects that we've been talking about, are you talking about the ones funded by the Council for Tobacco Research?

A. And others. The ones in the air pollution

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area that I worked on with Dr. Hickey.

Q. The work that you did for Anheuser-Busch, what did that involve, sir?

A. That was 15 years ago. It involved -- the statistical part of it involved developing samples and using proper sampling techniques to -- let's see -- to -- how can I describe it? To sample cross-sections of beer drinkers to see how well they could distinguish among brands. I think that's the simplest way to put it.

There were a lot of other activities, but that was sort of the central thing I was involved in.

Q. That didn't have anything to do with epidemiology?

A. No, none of these other projects had anything to do with epidemiology.

Q. Merck, Sharp & Dohme, what did you do for them?

A. That was a study in which they were looking at why it is that doctors write the prescriptions that they do, and they were concerned there with samples of doctors and an analysis of sample returns.

Q. And at the risk of burdening you one more

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time, I assume that that had nothing to do with epidemiology also?

A. That is correct. I think we can fairly say that the work I've done that's in epidemiology is the work that's been on these projects with Dr. Hickey.

Q. And maybe we'll make it easier, I'll give you Clelland 1 again. Can you just identify for us by number those studies that were funded by the Council for Tobacco Research?

MR. NORTHRIP: Are you talking about totally or partially?

MR. EDELL: Partially or totally. And I'd appreciate if you'd indicate whether or not it was partially or in total.

A. Well, that's very difficult for me to do on these earlier studies. In fact, I can't do that on the earlier studies. But let's start from the end.

The ones that we've talked about, I'm working back from 43, the ones I think from 33 on would have been -- 33 on to the end would have been funded entirely by the Council for Tobacco Research.

Now, before that, I'm not sure. There

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was some joint funding. There was funding before that, that came from the Regional Science Institute.

Q. What's that, sir?

A. It's a research operation affiliated with members of the Regional Science Department of the University of Pennsylvania, an independent research organization.

There was some funding from Resources For The Future, which was a, I think, rather well-known ecological economic group, which is down outside of Washington somewhere, and there was some funding through the Fells Institute, which is another -- which was another university institute. That one, in the area of local and state government.

Now, the funding sources for the money that came through those institutes, I'm not so sure of. Some of that was Federal money, and if you look at the citations on the individual articles, you will see some of that -- those sources mentioned. But I really can't sort it out in those cases.

Q. Do you teach any courses in epidemiology?

A. At the present? Or ever or what?

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Q. Ever, presently?

A. No, I think it's fair to say I never taught any courses in epidemiology, per se.

Q. Are there courses offered at the University of Pennsylvania in epidemiology?

A. I think there are courses in epidemiology offered presently by this Master's program in the medical school.

Q. You haven't been asked to teach any of that, though, right?

A. No, and I'm not doing any current teaching at all at the present.

Q. What are you doing at present?

A. Well, I'm doing mostly administration.

Q. How long have you been mostly involved in administration, sir?

A. Since 1981.

Q. When was the last time you taught?

A. 1981.

Q. And what courses were you teaching in 1981?

A. Probably a course called Quantitative Methods I, which is an introduction to mathematical methods course.

Q. Anything else?

A. Well, that and Statistics I, which is the

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basic statistics course, but I think that the last couple of years, I was teaching along '79-80, I was doing quantitative methods course.

Q. Have you ever taught a graduate courses in statistics?

A. Yes.

Q. When was the last time you did that, sir?

A. Graduate courses in statistics? Probably about 1972 or so.

Q. And what was that, sir?

A. Well, I don't remember exactly. Would you like to know what graduate courses I've taught at all?

Q. Well, that's --

A. Because I did a lot of that in the fifties and sixties.

Q. Let's work backwards on this curriculum vitae, let's work backwards in 1972. What graduate courses were you teaching then, we'll work back towards --

A. I can't tell you by year. I haven't thought about that for 15 years, so I can't tell you in what year I was teaching what courses back then.

Q. What courses have you taught on a graduate level?

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A. Okay. I've taught Basic Mathematical Statistics, I've taught Experimental Design, Nonparametrics Statistics, Sampling Methods. They're four. Probably a couple of others that I can't think of at the moment.

Q. Have you ever designed an epidemiological study?

A. Well, again, here we are at the definition again.

Q. Well, we'll use your definition of epidemiology.

A. Well, if the definition of an epidemiological study includes the work, for example, that was done with Dr. Hickey as reported in some of those papers, yes, I did.

Q. You would say that the work in those studies would be considered epidemiological work, is that correct?

A. It's a matter of how you define it. If you use the definition that some people do, which includes ecological population base studies as epidemiology, yes, then I have designed such studies.

Q. There's no generally accepted definition of epidemiology, is that what you're saying?

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A. Well, you asked me to define it a while ago. I defined it. And by my definition, I designed such studies.

Q. Well, let me ask you another question, then. Is there a generally accepted definition of epidemiology, other than the one that you just gave us?

A. Well, I'm afraid that I don't know the answer to that. But let me comment on it in the following way.

I've seen articles, for example, I've seen an article by Dr. Feinstein up at Yale who defines those sorts of studies within the purview of epidemiological studies. And I think as to whether there is a generally accepted definition of epidemiology, I am really not the person to ask that question. I can give you my definition.

Q. Who would you look to, to define epidemiology, sir?

A. I think I wouldn't look to any one person. I think a variety of people would define it differently.

Q. Have you ever done an epidemiological study to determine whether or not cigarette smoking caused disease in human beings?

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A. No.

Q. Have you ever designed an epidemiological study to determine whether or not there was a statistical association between cigarette smoking and disease in human beings?

A. No. The only epidemiological studies that I have participated in are those that we've talked about.

Q. Are there epidemiological studies, sir, that have yielded statistically significant figures in which cigarette smoking may be a predictor of mortality rates?

MR. NORTHRIP: Can you read that question back, please?

(The record is read back.)

A. Well, let me answer it this way. There are epidemiological studies that have found an association between cigarette smoking and mortality rates of various sorts.

Q. Is cigarette smoking a predictor of mortality rates, sir?

A. Well, what do you mean by a predictor?

Q. Have you ever used the term, predictor?

A. Yes.

Q. And how do you define it?

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A. I would use predictor in the sense of a variable which has some sort of association with a second variable.

Q. Using your definition, sir, is cigarette smoking a predictor of mortality?

A. In some studies, cigarette smoking -- some measure of cigarette smoking has been shown to be associated with mortality, and hence, in that sense, is a predictor.

Q. What do you mean by mortality?

A. Well, again, you used the term first. Should we say mortality rate?

Q. Mortality rate?

A. From a disease.

Q. What do you mean --

A. Most of the studies that have an association -- show an association, show an association between a measure of cigarette smoking and a mortality or morbidity rate.

Q. What do you mean by mortality?

A. Mortality rate?

Q. Mortality rate, yes.

A. Mortality rate, number of cases per number of people in the base group.

Q. Cases of what, sir?

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A. Whatever disease we're talking about.

Q. Mortality means number of cases, not number of deaths?

A. Mortality rate is -- well, mortality rate is proportion of deaths from the particular disease in question to the number of persons in the population.

Q. So there are studies that show that cigarette smoking is a predictor of death rates, is that correct?

A. In that sense, yes, in the sense of association.

Q. And there are studies that show that cigarette smoking is a predictor of heart disease, correct?

A. There are such associations.

Q. Do you believe that cigarette smoking is a predictor of lung cancer, sir?

A. In that sense, in the sense that there is an association.

Q. Do you believe that cigarette smoking is a predictor of heart disease?

A. In the sense that there is a statistical association, surely.

Q. Do you believe that cigarette smoking is not

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a predictor of lung cancer?

A. Well, that follows from the previous question.

Q. I understand that. I'm asking you whether or not you believe that cigarette smoking is not a predictor of lung cancer?

A. I believe that cigarette smoking is a predictor in the sense that it is associated.

Q. So your answer to the question, sir, is what?

A. (No response.)

Q. Want me to ask it again?

A. Well, I've really given it a couple of times.

Q. I don't think you've really answered the question, sir.

A. Well, try me again.

Q. It's a very simple question. Do you believe that cigarette smoking is not a predictor of lung cancer?

A. No, I don't believe that it's not a predictor of lung cancer.

Q. Do you believe that cigarette smoking is not a predictor of heart disease?

A. No, I do not, in the sense we've been using

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it now.

Q. How would you define significant statistical relationship?

A. First, you would pick arbitrarily a figure called a level of significance, and most people working in these areas would pick either .1 or .05 or .01, although that is an arbitrary choice. But first, there must be a standard involved.

Q. Could I just stop you there, sir, and ask you how one establishes that standard? Is that a matter of judgment?

A. It's a matter of -- it's a matter of judgment and practice, and there's a great arbitrariness in whether one uses .05 or .06, for example.

Q. What do you believe is arbitrariness?

A. It's something that cannot be proven correct.

Q. Okay, I'm sorry. You can continue.

A. All right. I was discussing statistical significance.

Q. Yes. Do you want -- before I interrupted, do you want me to have read back what you said already?

A. Why don't we do that. Sure.

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(The record is read back.)

A. Then the the procedure involves picking a sample. The sample is some subset of the population, and by population, I mean the whole group that is being studied.

One picks a sample by some random procedure. If one does not use a random procedure of some sort in selecting the sample, then this whole line of reasoning is flawed.

After picking the sample, the question is, does whatever statistic you are calculating from the sample, say a proportion or arithmetic or whatever the statistic may be, does this statistic have the characteristic of being likely to arise by chance in the population under study, and if you are working at the .05 level of significance, you say that the statistic under -- well -- the statistic under study is significant at the .05 level, if it is something that can be expected to arise from chance alone, less than five times in a hundred.

Q. Are you finished?

A. Um-hum.

Q. Did you review any of Dr. Miller's work in this case?

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A. Dr. Miller.
Q. Irwin Miller?
A. Yes, I have read some things of Dr. Miller. I can't say that I reviewed them. I've looked at some of his results.
Q. What results have you looked at?
A. I've looked at the results of some regression work that he has done.
Q. When did you look at that, sir?
A. Oh, I guess about six weeks or two months ago, something like that.
Q. Before I forget, sir, can epidemiological studies show causation with regard to cigarette smoking and disease?
A. No.
Q. Can epidemiological studies disprove causation with regard to cigarette smoking and disease?
A. No. Off the record, it would be a much simpler world if they could.
Q. Sir, is it possible to design a study to prove that cigarette smoking causes disease in human beings?
A. Well, that gets to what you mean by proof. Do you have a definition of what you mean by

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proving?

Q. Well, I'll ask you the question and we'll make it easier that way.

A. I don't know if that makes it easier or harder.

Q. Well, we'll see, we'll see. Do you have an opinion as to whether or not cigarette smoking causes lung cancer in human beings?

A. Yes, I have an opinion about that.

Q. And what is your opinion?

A. My opinion is that it's not established one way or the other.

Q. Okay. Can you design a study to establish causation with regard to cigarette smoking and lung cancer?

A. I doubt that I could do that.

Q. Do you know anybody who could?

MR. NORTHRIP: Are you talking now about --

A. Yes, let me comment on that a bit.

Q. On my question?

A. Yes, and then answer it.

Q. Well, why don't you answer it and then you can comment on it?

A. All right. Ask me again, then.

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MR. EDELL: Could you read that back, please?

(The record is read back.)

A. I'll answer it no, and now let me comment.

Q. Go ahead.

A. I can't do that because I believe that such a study would have to involve very deep biology, and that would be beyond my level of competence. In other words, there isn't any statistical study that will establish that, and I couldn't -- I couldn't even tell you who would be the proper geneticists and biologists to design such a study.

Q. Do you know whether or not such a study could be performed?

A. I don't know.

MR. NORTHRIP: When it's convenient, why don't we take a break.

MR. EDELL: Sure. Take a break.

(Recess at 10:45 a.m.)

(Resumed at 11:00 a.m.)

MR. EDELL: First, let me ask a question, Mr. Northrip. I thought we received all the information pursuant to the subpoena that this witness reviewed or relied upon in this case.

MR. NORTHRIP: That's correct.

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MR. EDELL: I don't remember receiving notification that he reviewed Dr. Miller's work or anything like that.

MR. O'NEILL: There's a letter, I think, that we --

MS. WALTERS: Schuman. Nothing about Miller.

MR. EDELL: I have a letter of June 11, 1987 from you, Mr. Northrip, and a September 9, 1987 letter from you, Mr. Northrip. I don't have anything further.

MR. O'NEILL: That deposition took place in October for Dr. Miller.

MR. EDELL: I don't remember. I thought we had sent a letter. Now that I'm asking, are there any documents that are responsive to the subpoena that we have not received?

MR. NORTHRIP: As far as I know, there would not be, other than the depositions mentioned in the letters that have been sent, and that I thought had been sent.

MR. EDELL: Can we find out exactly what was furnished to this witness from Dr. Miller?

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MR. NORTHRIP: I thought the deposition.

MR. O'NEILL: Yes.

MS. WALTERS: Were there any exhibits?

MR. O'NEILL: Deposition and exhibits.

MR. NORTHRIP: But my understanding, nothing other than the deposition and exhibits, is that correct?

MR. O'NEILL: That's all.

MR. EDELL: I'd appreciate if you would check on it, because I was not prepared to take this witness' deposition with regard to Dr. Miller.

MR. NORTHRIP: I thought it had been ---

MR. EDELL: It could be our mistake, but I'd like you to check that out.

MR. NORTHRIP: Okay.

BY MR. EDELL:

Q. Doctor, have you done any analysis of any data in this case?

A. No, I have not.

Q. Have you prepared any notes with regard to

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this case?

A. Notes?

Q. Notes.

A. No.

Q. When you reviewed all the material that you reviewed in this case, you didn't make one note, is that correct?

A. When I have -- see, I've been reading these articles for a number of years. Occasionally, when I read an article that interests me, I do a short summary of that article. That's not particularly relevant to this case. But I have, in my files, summaries of a variety of articles that I have read which were of interest to me.

Q. Dealing with cigarette smoking and health?

A. Sure.

Q. And do they relate to articles that you are relying upon in reaching your opinions in this case?

A. Some might.

MR. EDELL: I think that we are certainly entitled to those, Mr. Northrip.

MR. NORTHRIP: I don't believe you've asked for them, but I -- may I see what you asked for in the subpoena?

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MR. EDELL: Sure.

(Document handed to counsel.)

MR. NORTHRIP: What paragraph is it that you are referring to, two? I assume what Dr. Clelland is saying, and you can ask him, is that he, over the years, has read materials from some type of prepared summary, but that he has not prepared, reviewed or relied upon them in connection with formulating his opinion in this case.

MR. EDELL: Well, he just testified that he's relied upon some of these articles, and he made notes regarding some of those articles, and I think we're entitled to it.

MR. NORTHRIP: I don't think it was requested from the standpoint that the request asks whether he has prepared the notes, reviewed the notes or relied upon the notes in connection with this case. And I didn't understand him to be saying that. I think he said he has prepared those over the years. He's relying on the articles, not the summaries of them.

BY MR. EDELL:

Q. You don't refer to those summaries at all, sir?

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A. I have not referred to the summaries in connection with preparation for this case.

Q. And you don't intend to for the purposes of trial?

A. No, I hadn't thought I would. I have reviewed some of the articles, themselves.

MR. NORTHRIP: Again, I would state for the record that that isn't what you requested, what he might do in the future. It states what he has prepared, reviewed or relied upon in formulating his opinion.

BY MR. EDELL:

Q. You didn't make any notes of the depositions that you reviewed in this case, is that correct?

A. No, none at all.

Q. Were you instructed not to?

A. No.

Q. What opinions do you have concerning the transcripts that you reviewed in this case, sir?

A. That's a fairly general question. Could you make it more specific?

Q. No.

MR. NORTHRIP: Well, then I would object to it. It's too general to reply to.

MR. EDELL: That's fine.

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BY MR. EDELL:

Q. You can answer the question. Unless you're directing him --

MR. NORTHRIP: I'm not directing him. He's given you an answer, he says it's too general for him to respond to it.

BY MR. EDELL:

Q. You can't answer that question, sir?

A. I really wouldn't know how to answer it.

Q. What comments, sir, do you have with regard to the depositions of Dr. Schuman, Dr. Mills, Dr. Feldman and Dr. Gould?

MR. NORTHRIP: I would object. These depositions are each a minimum of one day, some are several days depositions, and I think it's unfair to ask the witness to give his opinions on the entire deposition, unless you want to present them to him here and allow him to review them and comment on them.

MR. EDELL: Mr. Northrip, I think, likewise, if you think that --

MR. NORTHRIP: And I think that you

MR. EDELL: Let me finish. You made a statement, let me make a statement. I'm paying for the transcript, too.

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You sent me a letter of September 9, 1987, in which you say, "It is anticipated that Dr. Clelland may comment upon the above-described materials at trial."

You don't indicate at all what comments he has, and this purports to be a report pursuant to our Federal Rules.

All I am trying to do is to find out what comments, since you weren't kind enough to incorporate it in the report, this witness has with regard to those transcripts. And we'll mark this for identification so the Court sees it.

MR. NORTHRIP: I tried to mark at least a half dozen letters from Walters containing the same precise information sent, before I sent this one. We decided that this was the way that this was to be handled, based on Ms. Walters' experience and the way she was handling them. Whenever we had asked similar questions at deposition regarding a general, have you read a deposition, what are your comments on it, we have immediately received the objection that this is too general, and that the person cannot review and give us those comments.

MR. EDELL: I certainly don't recall

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any such objections, Mr. Northrip, but the record will speak for itself, and I would request that the witness respond to the question. If you want to make a direction to him and if we're going do continue with further colloquy, which is in direct contradiction to the Magistrate's directions in this case, we'll get him on the phone.

MR. NORTHRIP: Fine, get him on the phone if you think it's appropriate. I would be happy to show him the colloquy that you engaged in, in the last session of Dr. Schuman, which is far more extensive than anything --

MR. EDELL: I'll be happy to do that, but my recollection is that the direction of the Magistrate was subsequent to Dr. Schuman's deposition.

MR. NORTHRIP: And that's incorrect, sir.

MR. EDELL: Let's mark this for identification, please.

(Exhibit Clelland 2 marked for identification.)

BY MR. EDELL:

Q. Dr. Clelland, I'm showing you what has been marked as Clelland 2 for identification, sir.

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It's a letter from Mr. Northrip to Ms. Walters of my office on September 9, 1987, which purports to be a summary of your opinions in this case.

It states that you are anticipated to comment, that is, anticipated that you will comment on the deposition and exhibits of Dr. Schuman, Dr. Mills, Dr. Feldman and Dr. Gould. And I would like to know what your comments are, sir.

A. At this point, I have not put any comments in order, so I can't respond to your question.

Q. When you say you have not put them in order, what do you mean, sir?

A. I have not thought about what I might say.

Q. You have not formulated any opinions with regard to those depositions, is that correct?

A. Let's see, have not formed any opinions -- probably not true. That's a very general statement. I probably have some opinions that derive from looking at those, but I haven't really thought about formulating them and organizing them.

Q. What opinions do you have, sir, as you sit here, today, pertinent to your review of Dr. Schuman's deposition and exhibits, Dr. Mills'

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deposition and exhibits, Dr. Feldman's deposition and exhibits, and Dr. Gould's deposition and exhibits?

A. Well, as I said before, I think that is a rather unfair question. If the questions were asked specifically about various things, I would try to respond to them.

Q. Well, I have no idea what Mr. Northrip anticipates you commenting on, other than what he has provided me in this, so let me go through deposition by deposition, sir.

What opinions do you have regarding your review of Dr. Schuman's deposition and exhibits?

A. Well, I have -- I can think of one opinion that I have.

Q. I want to know all of them, sir.

A. What?

Q. I want to know all of the opinions.

MR. NORTHRIP: Can you give them one at a time or --

MR. EDELL: I just want him to understand the question, Mr. Northrip.

A. Now, understand that I have not looked at Dr. Schuman's testimony for a couple of months, so

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I do not have everything that was said in that testimony well in mind at all.

One thing did sort of stand out in my mind, and that was the analysis that was appended to Dr. Schuman's deposition concerning various data on atypical carcinoids. I did form an opinion about that.

Q. Tell us your opinion in that regard, sir.

A. Well, Dr. Schuman's material showed that he had put together a sort of summary of data from a number of sources in the literature showing relationship between smoking and atypical carcinoids. I recall that.

And I remember finding his methodology highly objectionable.

Q. In what way was it objectionable, sir?

A. It was objectionable in that one cannot take data from a variety of sources like that, put it together as though it were done in a careful study and draw conclusions from it. And I was very surprised to see Dr. Schuman doing that.

Q. Why were you very surprised to see Dr. Schuman doing that?

A. Because Dr. Schuman is, I believe, a well-known epidemiologist, and I just was very

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surprised to see him do those sorts of things, which normally wouldn't be done.

Q. Any other comments with regard to Dr. Schuman's deposition or the exhibits appended to his deposition?

A. That's all that occurred to me at the moment.

Q. What opinions do you have with regard to your review of Dr. Mills' deposition and exhibits?

A. I think Dr. Mills, as I remember the exhibits, I think some of Dr. Mills' data fed into Dr. Schuman's data that I talked about before, and I didn't like the use that Dr. Schuman made of Dr. Mills' data.

Q. Any other opinions with regard to Dr. Mills' deposition and/or exhibits?

A. Well, I don't think of anything at the moment. I'm sure if I go back and look at them again, I'll formulate some other more careful opinions.

Q. What opinions did you formulate upon your review of Dr. Feldman's deposition and exhibits?

A. I don't have anything in mind at the moment that relates to Dr. Feldman.

Q. What if any opinions did you formulate with

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regard to Dr. Gould's deposition and exhibits?
A. I don't think I formulated any specific opinions on Dr. Gould.
Q. Who is Dr. Gould?
A. Dr. Gould is a gentleman who is, I think, widely known as an expert in the area of atypical carcinoids. I've read several articles of his on the subject, where he was a co-author. And from reading those articles, I have the impression that he is quite a prominent expert in this area.
Q. Before your participation as an expert in this case, had you reviewed any articles by Dr. Gould?
A. Let me see, my participation would have started in 1984. Probably not.
Q. Prior to your acting as an expert -- strike that. Were you given the articles by Dr. Gould?
MR. DECKER: Object to the form of the question.
A. That's hard to say. Articles that I have read come from several sources. Let me just mention that.
The articles that I read are partially things that I read in the normal course of events, that is, because of my participation with Dr.

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Hickey in work in this area, I have been reading articles for many years on a variety of topics that relate to air pollution and smoking and this whole area.

Now, periodically, I go over to the medical school library and look at the Index Medicos and other such items, and take copies of articles that interest me.

Also, since I have become involved in this case, from time to time, Shook, Hardy & Bacon send me packets of materials, and some of these are things that I dig out on my own and I ask them to provide me copies of, and some, they simply send me as things which they think I might be interested in. So it's very hard more for me to say on a specific article what its source was.

The articles by Dr. Gould could be things that Shook, Hardy & Bacon sent me, they could be things that I found in Index Medicos and such places and either took a copy myself or requested them to send me a copy.

Q. Are there correspondence between you and Shook, Hardy & Bacon in this case?

A. There would be lists of things that I requested in the way of articles. That's the only

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correspondence.
Q. When you say lists, did you prepare a letter to them asking them for articles?
A. Yes.
Q. And did they send you a letter back saying Dr. Clelland, here's the articles?
A. Um-hum.
Q. So that there exists correspondence between you and the Shook, Hardy & Bacon firm?
A. I don't know whether or not it exists or not. I don't keep those such things.
Q. You throw them away?
A. Um-hum.
Q. I'm sorry, sir?
A. I may have some of lists, but I don't keep the covering letters.
Q. You throw away the correspondence?
A. Sure, there's nothing in it.
Q. That's your normal practice is to throw away correspondence?
A. That isn't what I said.
Q. What is your normal business practice?
A. I said these cover letters had no content and I did not keep them.
Q. Is that your normal practice, sir, to

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discard correspondence when you're a consultant in a case?

MR. TUCKER: Object to the form of the question.

MR. DECKER: Object.

A. It is my normal business practice to discard all letters which I believe do not have content.

Q. Have you ever received a letter of content from Shook, Hardy & Bacon?

A. I don't think so. Correspondence is rather limited and limited to these sorts of things or these requests for articles and responses on that.

Q. But you have lists of the articles that you requested of them, is that correct?

A. I probably have some of them. I'm not sure I would have kept all of them.

MR. EDELL: Did we get those lists?

MR. O'NEILL: They weren't covered by the --

MR. EDELL: They weren't covered by the subpoena either, is that your position? Any and all documents including but not limited to correspondence, notes, memorandum, reports or other documents regarding communications with tobacco companies, or their representatives

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regarding any research, consultation, employment or testimony of any kind for or at the behest of any cigarette manufacturer or the Tobacco Institute, that's not covered?

MR. O'NEILL: That's not what you asked. That, we responded to, and there was no correspondence on that. That's in regard to research supported by the Council for Tobacco Research.

MR. EDELL: No, it says, at the -- acting as a consultant, employment or tests regarding research, consultation, employment or testimony of any kind for or at the behest of any cigarette manufacturer or the Tobacco Institute.

I understand Philip Morris to be a cigarette manufacturer. I understand this witness to be a consultant in regard to this litigation. I understand that he's offering expert testimony in this case, and therefore, either there should have been an objection or we should have been given the documents to which this witness just referred to.

BY MR. EDELL:

Q. Do you have your file here today, sir?

A. No, I do not.

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Q. Were you told not to bring anything?
A. No.
Q. Why didn't you bring anything?
A. Why should I? I understood I was to testify in the case and I saw no reason to bring anything.
Q. Have you ever acted as an expert witness before?
A. An expert witness -- I was a -- I was deposed in one case, but it was settled before it got to Court, so I never got a chance to actually appear as a witness.

MR. NORTHRIP: If we have any of those materials, we'll supply them to you.

MR. EDELL: It's going to be too late because the deposition is going to be over.

MR. O'NEILL: You're asking for correspondence that Dr. Clelland has regarding lists of articles that he requested from us, and as he has testified, he doesn't have many of those or maybe just some of the lists that were attached to those letters. And --

MR. EDELL: I don't understand.

MR. O'NEILL: We responded by providing you with a document on the articles that he substantially is relying on for his testimony,

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some of which were articles that he had requested from us.

MR. EDELL: That's nonresponsive to the subpoena, counsel. It may be an attempt for you to avoid the obvious deficiencies in your response to the subpoena, but it is not an adequate response to the subpoena.

BY MR. EDELL:

Q. How far is your office from here, sir?

A. Oh, about probably 15 miles.

Q. Do you have the lists in any existing correspondence in your office?

A. They would be in my office.

MR. EDELL: I would request that over the luncheon hour, we get copies of the stuff.

A. I don't know how I would do that.

Q. You can discuss it with the attorneys who retained you in this case.

Tell us about the case --

MR. NORTHRIP: We'll get you any materials, and they will be of no substance, but I don't know if we'll be able to do it over lunch.

BY MR. EDELL:

Q. Tell us about the case in which you were deposed, sir.

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A. Oh, this was a case where I was going to testify as an expert witness for the Ford Motor Company on the matter which concerned losses in their repossession activity of cars that had been sold but not paid for. It was a question of the sampling procedures used to check the data on these repossessions.

Q. When did you testify, sir?

A. I was deposed, perhaps, I don't know, late seventies, sometimes.

Q. Do you have a copy of the transcript of that proceeding?

A. No.

Q. Where did the case occur, where was it pending?

A. I have no idea.

Q. Who were the lawyers who retained you?

A. I have no idea.

Q. Do you have any records in regard to that or you just discarded them?

A. No, no records.

Q. Do you keep billing records, sir?

A. Billing records?

Q. Billing records.

A. (No response.)

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Q. I assume you bill these gentlemen for the time that you spend?

A. Yes, I bill them. I probably have some billing records, yes.

MR. EDELL: I would also like the billing records, counsel. Those were certainly responsive to the subpoena, also.

THE WITNESS: Those are at my home, and that's another 15 miles.

BY MR. EDELL:

Q. How much time have you spent on this case?

A. How much time -- oh, do you want me to give you sort of a vague estimate? I can't say exactly at this point.

Q. Approximation, sir.

A. Let's see, probably around 45 to 60 days. Most of that is reading materials.

Q. Reading --

A. That's a guess.

Q. Reading materials --

A. Reading the literature.

Q. Furnished to you by Shook, Hardy & Bacon or seeking it out?

MR. DECKER: Objection.

A. Or pulled out from files or from the library

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by myself.

Q. And how much do you charge a day?

A. A thousand dollars a day.

Q. You mean I get a rebate?

MR. TUCKER: Object to the form of the question.

MR. NORTHRIP: You'd have to put it high to satisfy some of your experts.

MR. EDELL: Well, when you talk about Ph.D. and an M.D. degree, the rates are a little higher.

BY MR. EDELL:

Q. I'm going to show you a document which was furnished to us by -- I won't show you a document which we've been furnished yet.

Have you acted as an expert in any other case other than the Ford case and this case?

A. No, none.

Q. Have you met with any other experts who are acting as expert witnesses in this case?

A. No.

Q. You told us about one meeting in preparation for this deposition. Is that the only time that you met in preparation for this deposition?

A. For this deposition, yes. We -- there were

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other meetings before other purported depositions which did not come off, and a similar meeting I think in January, at the time when deposition had been scheduled, but was then canceled.

MR. NORTHRIP: We met three times in your office and Mr. Darnell's office canceled the deposition after it was scheduled.

MR. EDELL: Will you mark that, please.

(Exhibit Clelland 3 marked for identification.)

BY MR. EDELL:

Q. I'm going to show you Clelland 3 for identification, sir. Other than the handwritten notes or check marks or notations on there, can you tell us what the document is?

A. Yes, this is -- let me skim through it, here. That's the list of articles that I have read and that I am relying on for my testimony in this case.

Q. Which of those articles were furnished to you by Shook, Hardy & Bacon?

A. Oh, I have no idea.

Q. The correspondence that you threw out would have told us that, is that correct?

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A. The correspondence, some of which has probably not been thrown out, and there's correspondence which may exist and which might tell us that. Watch that point, though. The --

Q. Watch what point, sir?

A. That last question of yours, that's a little tricky. There are three sorts of articles, and we got to keep them straight.

Q. Right.

A. There's material that was sent to me by Shook, Hardy & Bacon without my requesting it.

Q. Got you.

A. There's material, and there will not be in any letters in my file. There will be material that is -- that I requested of Shook, Hardy & Bacon, and that's the thing that these lists cover. And then there's material which I got, myself, and there's nothing on that in the way of correspondence. There are three types.

Q. So let's make sure we both understand each other.

A. No, I can't tell you which of these articles is from which.

Q. There are articles that were furnished to you without your requesting them from Shook, Hardy

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& Bacon, is that correct?

A. Yes, there were, yes.

Q. And they were furnished to you under specific cover letters, correct?

A. I don't know, I think they may have been sent to me without cover letter. I'm not sure that there was a cover letter.

Q. Okay. In other words, you'd get them in an envelope, and there would be no indication of who it was from or where it came from, right?

MR. DECKER: Object to the form.

A. Or one of the lawyers might have, when we were talking --

Q. Given you documents.

A. -- paying a visit, might have given me some.

Q. You didn't record what documents were given to you without your requesting them from Shook, Hardy & Bacon, is that correct?

A. No, I did not.

Q. Then there are documents that you requested of Shook, Hardy & Bacon?

A. Um-hum.

Q. And you say that there are documents in your possession which would show us which documents those are.

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A. I don't know whether there would be documents in my possession that would show that complete group of documents, but there ought to be some lists that would identify at least some of them.

Q. And then there's a third category of documents that you already had in your possession?

A. Or that I required by Xeroxing myself, and they're all mixed up on this list, and it would be very difficult -- I can't sort that out.

Q. Who prepared that list?

A. Well, I did, basically.

Q. Well, when you say basically, tell me exactly who the list was prepared by from the start to the finish.

A. All right. I think I can do that.

Before the first of these meetings that I had with lawyers from Shook, Hardy & Bacon, I assembled from my files a big stack of materials, like that.

Q. Let the record reflect the witness is showing --

A. One foot.

Q. -- showing approximately one foot off the table.

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A. And I carted this down to the hotel where we met. And I said that this was material I had that in my opinion seemed to be relevant.

And we spent some time going through this list with the idea of chopping it down to a more manageable size. It was really a great big stack. And we discussed a number of those items, and after that discussion, I then discarded a batch of stuff that was on -- that I had brought down, and we came down to this list as something that seemed to be of manageable size, and that I was comfortable with as far as my testimony was concerned.

Q. When you say this list, you're referring to Clelland 3 for identification?

A. Clelland 3, yes.

Q. When did this happen, sir?

A. This was put together, I guess my recollection is that it was put together at the meeting last January. We had several days before that scheduled deposition. I think that's correct.

Q. Did you physically type up this list, sir?

A. No, I did not. What we did was to segregate the documents into two stacks, and it was agreed

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that one stack would be what I would use and the other stack would be what I would not use, and then someone at Shook, Hardy must have typed this particular thing up and sent it to me for review, and I checked it, and indeed, at a later date, we decided that there should be some additional items put on it, some of which I suggested, a couple of which Shook, Hardy & Bacon suggested, particularly the area of heart disease, which apparently had entered the case after January in some way that I'm not too sure.

And then the final version, which is this, was again sent to me for checking, which I performed.

Q. And you have the correspondence in which the document, Clelland 3 was sent to you, or was that another piece of correspondence you threw out?

A. I don't know that there was any correspondence connected with it.

Q. Well, you received a substantial amount of material over a period of time from Shook, Hardy & Bacon. Did most of it come in without correspondence?

MR. TUCKER: Object to the form of the question.

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A. The substantial body of material was reprints. That was the --

Q. I understand that.

A. -- the local thing, and if there were -- some of this would have been with cover letters and some of it would have not been. The cover letters would have said, here is the material you requested, and I don't keep that sort of stuff.

Q. Okay.

A. I put that in the wastebasket.

Q. Now, the stuff that you brought down to this January meeting, these articles that you brought down to this January meeting that didn't make it onto Clelland 3, where did those articles come from?

A. They're out of my file of reprints, the same as the ones that didn't make it.

Q. And what was the subject of these reprints that didn't make it onto Clelland 3?

A. A great variety of subjects, and I don't -- it was more a matter of taking a very large pile of stuff on a whole lot of subjects, and paring down each portion of this to a more manageable size. So I would say that they -- that there were discarded articles in many of the areas. I --

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Q. Have you reviewed all the articles that you came into that hotel meeting with?

A. I read every one of them.

Q. In regard to your opinions in this case?

A. Well, I read every one of them at some point, and they were all, in a sense, relevant to the case, but there's a great deal of duplication in these articles, and I really didn't -- I was very glad to pare the list down.

Now, I suppose it would be true that if you asked me if this exact list represented everything I'd ever seen that formed my opinions in this case, I would say that probably wasn't true, because I suppose there are some things that haven't made it on here that have influenced me.

Q. Well, we know that, because you went through this process with the lawyers from Shook, Hardy & Bacon and decided what should or should not be on the list.

A. This thing -- this list --

MR. NORTHRIP: I object to that, and the implication that somehow we have told him to leave things out to play a role in formulating his opinion. That simply is not true.

What he's saying is the same thing

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I've heard from a multitude of your witnesses, that I rely upon all of my reading and my experience. I've heard it from Dr. Schuman and others.

MR. EDELL: I'm going to call the Magistrate.

MR. NORTHRIP: Fine, call him.

(Recess at 11:35 a.m.)

(Resumed at 11:40 a.m.)

BY MR. EDELL:

Q. If we may continue, sir?

A. Certainly.

Q. Are there any other articles that you are going to rely upon, sir, in terms of your opinions in this case, other than those that are contained on Clelland 3 for identification?

A. You know, that's, again, a little hard to answer. This is certainly -- this will be the basis of my testimony. I have some difficulty in saying that there's no other article I've read that has had any influence upon me. This is substantially the basis for my testimony.

Q. I want to know whether or not, as you sit here, today, there are any other articles that you base your opinions on that are not contained in

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Clelland 3 for identification.

A. This is what I based my opinions on.

Q. So there are no other articles that you can recall at this time, is that correct?

MR. NORTHRIP: I'm going to object to that for the same reason that --

A. No.

Q. Sir?

A. I can't say that there are absolutely no other articles that have influenced my thinking, but I can say that substantially, this is what I base my testimony on.

Q. Is there any data that you base your opinions on, other than what is reflected in Clelland 3?

A. Data.

Q. Data.

A. Well, you asked me earlier about the data that Dr. Schuman had provided, and I have commented on that.

Q. Right.

A. So the answer to your question is, there is that particular item that is outside.

Q. Anything else?

A. Not that occurs to me at the moment.

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Q. Can epidemiological studies show probabilities of a relationship between an agent and a disease?

A. Probabilities? Yes.

Q. Do you know whether or not the epidemiological studies with regard to cigarette smoking and lung cancer show a probability in terms of the relationship between cigarette smoking and lung cancer?

A. They show an association, and some of those associations, the authors present with probabilities attached.

Q. Can one conclude, based upon an epidemiological study, that there is probably a relationship between an agent and a disease?

A. A relationship, a statistical relationship, yes.

Q. Can one draw a conclusion that probably the agent causes the disease being studied?

A. From statistical studies?

Q. Yes, sir.

A. No.

Q. You certainly would never make that conclusion, is that correct, sir?

A. I would not make that conclusion.

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Q. In any study that you performed, you never concluded that probably the agent being studied caused a particular disease in human beings, is that correct?

A. I don't recall ever having reached such a conclusion. You sound as though you had found such a situation.

Q. If you had made such a statement, it would be incorrect, is that right, sir?

A. Well, let's look at the statement and see. If you found such a statement, bring it out and I'll be glad to comment on it.

Q. If you know of such statements, sir, let me know.

A. I don't. Do you?

Q. When you take my deposition, you can get the answer.

A. You won't tell me, will you? Okay, fair enough.

Q. You'll find out at trial, sir, I promise you that.

A. Fair enough.

MR. NORTHRIP: Do you have the study, Mr. Edell, that you're referring to?

MR. EDELL: When you take my

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deposition, Mr. Northrip, you'll find out.

MR. NORTHRIP: You've asked for that when I've interrogated your witnesses, I believe, isn't that correct?

MR. EDELL: And I think you've similarly responded, Mr. Northrip.

MR. NORTHRIP: I hope so.

BY MR. EDELL:

Q. Sir, do you have an opinion as to whether or not cigarette smoking probably causes lung cancer in human beings?

A. No, I don't think that it is at all clear what causes lung cancer in human beings, so I don't have an opinion on it.

Q. Do you have an opinion as to whether or not cigarette smoking probably causes heart disease in human beings?

A. No, I think that that is even more unclear, and I do not have an opinion on it.

Q. Do you have an opinion as to whether or not cigarette smoking probably is a cause of lung cancer in human beings?

A. Same answer.

Q. Do you have an opinion as to whether or not cigarette smoking probably is a contributing

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factor to the development of lung cancer in human beings?

A. Same answer.

Q. What is that, sir?

A. No, I don't have -- I think that is also unclear, and I don't have an opinion.

Q. Do you have an opinion as to whether or not cigarette smoking is a risk factor in the development of heart disease?

A. If we define risk factor as a factor which shows a statistical association with a certain disease, there are certainly studies that show such association between cigarette smoking and mortality from heart disease.

Q. The question was, is it Dr. Clelland's opinion that cigarette smoking is a risk factor in the development of heart disease?

A. Risk factor defined in that way, yes, I do.

Q. Sir, are you aware as to whether anything is a cause of lung cancer in human beings?

A. I'm not aware of anything that has been proved to be the cause of lung cancer in human beings.

Q. Is it your opinion that asbestos is not a cause of lung cancer?

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A. It's my opinion that asbestos has not been proved to be a cause of lung cancer in human beings.

Q. Is it your opinion, sir, that radiation is not a cause of cancer in human beings?

A. Yes, I think that is my opinion.

Q. Is it your opinion, sir, that radon is a cause of cancer in human beings?

A. It's certainly my opinion that that has not been proved at all.

Q. What do you mean by at all?

A. Well, there are health spas in Europe where people go for radon treatments to pep them up, so I think that's a very questionable area.

Q. Much more questionable than cigarette smoking and lung cancer?

A. I can't compare them.

Q. What could you compare it to, sir, so that I have some idea?

A. I just said it's a very --

MR. NORTHRIP: Would you read that question back, please?

(The record is read back.)

A. I don't think I can make a comparison.

Q. Sir, do you have an opinion as to whether or

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not pollution causes cancer in human beings?

MR. DECKER: I object to the form of the question.

A. Well, I don't think it's been established that pollution is a cause of cancer in human beings.

Q. Do you have an opinion as to whether or not air pollution causes lung cancer in human beings?

A. Do I have an opinion? I think it's a possibility. I don't think it's been proved.

Q. Is it a possibility that cigarette smoking causes lung cancer?

A. Sure.

Q. Is it a possibility that cigarette smoking causes heart disease?

A. Sure.

MR. TUCKER: Object to the form of all possibility questions.

A. It's possible.

Q. Do you have an opinion as to whether or not high blood pressure causes heart disease?

A. No, I don't have an opinion on that.

Q. Do you have an opinion as to whether or not cholesterol causes heart disease?

A. It's interesting. Up until fairly recently,

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I would have thought that that was a pretty good possibility. I've been reading some stuff lately where people are attacking cholesterol as a causal factor, so I have no opinion on that.

Q. These writings attacking the relationship between cholesterol and heart disease has led you to question that relationship, is that correct?

A. Um-hum.

Q. I'm sorry?

A. Yes, but of course, it's never -- it's nothing that's ever been proved in the first case in the considerable scientific work on the area of cholesterol that I have read.

Q. Does anything cause heart disease, sir?

A. Does anything cause heart disease? Well, I don't know as anything -- I'm aware that there are various types of heart disease. I don't know a great deal about this. I think I would say that this is getting quite outside my expertise in the heart disease area.

I know quite a lot about statistical studies related to heart disease, but as far as the biology is concerned, I really don't know a great deal.

Q. Sir, do you have an opinion as to whether or

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not anything causes heart disease?

MR. DECKER: Object to the form of the question.

A. Well, it's likely that there are a variety of things that cause the ailment, but I don't -- I'm not aware that it has been proved that anything in particular causes heart disease, and there are various types of heart disease which one might think of having different causes. But again, you're getting somewhat beyond my expertise.

Q. What is likely to cause heart disease, sir?

MR. DECKER: I object to the form.

MR. TUCKER: I object to the form of the question.

A. What is likely to form heart disease.

Q. Yes, you used that term in the prior answer, likely; what is likely to cause heart disease?

A. I don't know what is likely to cause heart disease.

Q. Do you know anything that is likely to cause heart disease?

MR. TUCKER: Object to the form.

MR. DECKER: Object to the form.

A. I said that this is getting rather beyond my

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expertise, and I don't think I can respond to that.

Q. You said that you did have an opinion as to whether or not radiation causes cancer in human beings, didn't you?

A. No.

Q. You don't have an opinion in that regard?

A. I said that that, as well as other factors that had been identified in the literature as possible sources, that relationship, causal relationship hadn't been proved, as far as I know.

Q. Can epidemiological studies show that it is more likely that one substance as opposed to another substance causes heart disease or lung cancer in human beings?

A. No, I think not. I think that's a matter of biology and genetics and medicine.

Q. So --

A. See, my -- Mr. Edell, my approach here is that the statistical epidemiological part of all these investigations certainly provide very interesting clues, but that in the matter of cause, it's really a matter for the biologists, medical people to do the definitive work.

Q. Well, let me ask you about that then, sir.

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Do your statistical skills permit you to make judgments with respect to the likelihood --

MR. NORTHRIP: Excuse me, did you finish your answer?

THE WITNESS: Yes, I did, sir.

MR. NORTHRIP: Okay, all right.

Q. -- the likelihood that a particular agent causes a particular disease?

A. Cause is not something that can be shown by statistics, so the answer is no.

Q. Can you, using your statistical expertise, make judgments with regard to the strength of an association between an agent and disease?

A. Oh yes, strength of association is a statistical matter, and statistics and the statistical part of epidemiology can certainly develop associations.

Q. What is the strength of association between cigarette smoking and lung cancer?

A. Well, it varies greatly, depending upon what study you're looking at. It's measured -- those associations are sometimes measured by correlation coefficients, sometimes more often by relative risks in epidemiology, and there's a whole spectrum of numbers that come out of different

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studies.

Q. What is your opinion, sir, with regard to the strength of association between cigarette smoking and lung cancer?

A. Well, I don't know what strength of an association really means. It's not a term statisticians use.

Q. You just answered the question, I asked you whether or not you can judge the strength of an association using your expertise as a statistician and you said yes. Now, I'm asking --

MR. NORTHRIP: Can we hear that back, please?

A. Let's have that again.

(The record is read back.)

A. Mr. Edell, you were quite right on your question.

Q. Now, sir, getting back to the question in hand, what is Dr. Clelland's opinion with regard to the strength of association between cigarette smoking and lung cancer?

A. We have to first define what is meant by strength of an association.

Q. What did you mean in terms of strength of association when you responded to my prior

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question?

A. I used the term in a rather vague and imprecise fashion, and as far as the strength of an association is concerned, this is a term which doesn't have a great deal of meaning.

Q. What does it mean to you, sir?

A. In comparative terms, you could say that a correlation coefficient, which is larger than a second correlation coefficient represented a stronger relationship, but what you can't say is that a correlation coefficient of, say, .5 is strong or weak or whatever. It's -- there's no generally accepted definition of what strong means in an absolute sense. And I'm sorry if I was imprecise on that.

Q. No doubt. Let me ask you this, then, sir. Could you describe for us the strength of association between drinking water and lung cancer, as opposed to cigarette smoking and lung cancer?

MR. DECKER: I object at the form of the question.

A. Well, it's a question of what study one is talking about.

Q. In your opinion, sir, not one study, your

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opinion. You're an expert.

A. Those particular -- those particular associations vary greatly, depending upon what studies one is talking about.

Q. I'm asking as to your opinion as an expert in statistics.

A. All right, I'll answer it this way, there are relatively few studies that show associations between drinking water and lung cancer, did you say?

Q. Yes, sir.

A. Lung cancer -- relatively few studies. Some of the studies that I did earlier have some numbers on that.

There are, of course, lots and lots of studies that associate cigarette smoking and lung cancer.

In general, one would say that the associations between cigarette smoking and lung cancer from these studies are larger, in that sense, stronger than the associations between calcium carbonate concentration in drinking water or whatever, and lung cancer.

Q. Let me ask you this, sir --

A. Larger numbers.

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Q. Let's compare the strength of association between cigarette smoking and lung cancer to radon exposure and lung cancer.

A. Well, I haven't seen much in the way of correlations between radon exposure and lung cancer.

Q. What's your opinion, sir?

A. Well, I haven't seen data on that, and I don't think there are many studies on that, so I really don't have an opinion about that.

Q. So you can't compare the strength of association between cigarette smoking and lung cancer as opposed to radon and lung cancer, is that correct?

A. No, I've seen quantities of studies showing the association between cigarette smoking and lung cancer, and the association appears to be real.

I have not seen a corresponding body of material on association between radon and lung cancer.

Q. Because you haven't made a review of the literature in that regard?

A. I don't know that it exists.

Q. What do you mean you don't know that it exists?

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A. Just that, I do not know whether or not there are such studies. I've done a little reading in the radiation area, but I certainly haven't covered it extensively.

Q. Has radon been identified in the atmosphere, sir?

A. It's been identified in the atmosphere, yes.

Q. And have you done studies to see what if any association there is between people's exposure to various substances in the atmosphere and disease?

A. Um-hum, I have.

Q. Have you considered radon in that regard?

A. Considered in a couple of studies in the early eighties, we had ionizing radiation generally in the air as one variable, yes, radon is one component of ionizing radiation.

Q. And you found a negative association, did you not?

A. In, let's see, in --

MR. NORTHRIP: If you're referring to a particular article, Mr. Edell, that you have, I request that the doctor be allowed to look at it.

A. There are two or three different studies. Do you have a particular reference?

Q. No, I don't, sir. I've reviewed as much as

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I could of your reports. I did not bring them with me. This is just my recollection that, in fact, there was a negative association that you found.

A. I think that was true in one case.

Q. Could you describe for us the strength of association between lung cancer and cigarette smoking as opposed to lung cancer and ionized radiation?

A. Well, if we go on the basis of that one study --

Q. No, all studies that you're aware of.

A. Well, I'm not aware of -- I'm not aware of hardly any studies that have looked at ionizing radiation. So I consider my information background there fairly small.

Now, it's true that we looked at this in the population sense in a couple of studies that we did, and I believe you are correct in saying that in one case, we found a negative association. So I would say --

Q. When you say negative association, what do you mean, sir?

A. Well, a negative coefficient of regression in the regression equation that was predicting.

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Q. How would you explain that so that I could understand it? I mean, let's try to reduce it to laymen's terms. Could you do that for us?

MR. NORTHRIP: Object to form.

A. Let's say it translates --

Q. Maybe you could never reduce it to the level so I could understand it, but --

MR. NORTHRIP: Objection to form.

A. Let me try, let me try. Now, we're talking about a situation where there is a variable in a regression equation, linear regression equation that has a negative coefficient.

That says that, for that particular variable, it is, first of all, associated with the variable one is trying to predict, and secondly, that the association is such that as the first variable, say ionizing radiation concentration goes up, the value of the thing you're trying to predict goes down, so it's a negative association in that way.

And that means that the contribution of the predicting variable to the variable you're trying to explain is positive, but it's positive -- that's contribution of variance, and that the actual relationship is a negative one,

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that one increases, the other decreases.
Q. So the more ionized radiation that you would have, the lower the incidence you would expect of lung cancer, is that correct?
A. That's correct, in that particular equation, um-hum.
Q. Whereas with regard to cigarette smoking, the studies have shown that the more cigarette smoking that you have, the higher the --
A. There is certainly a positive --
Q. -- incidence?
A. In many studies, there is a positive association between cigarette smoking behavior of one sort or another and lung cancer mortality, sure.
Q. So with that understanding, how would you compare the strength of association between cigarette smoking and lung cancer as opposed to ionized radiation to lung cancer?
A. Based on the single study of ionizing radiation, it is clear that the one contributes positively, cigarette smoking, the other contributes negatively, but it's only one equation. And as we all know, there are dozens and hundreds of studies showing positive

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association in one way or another between cigarette smoking variables and lung cancer mortality.

Q. Same is true with regard to heart disease, isn't that correct, sir?

A. I think there are fewer studies, but generally, I think a positive association. Probably less clear, but --

Q. That is, the more cigarette smoking we have, the greater the incidence of heart disease, is that correct?

A. I think that's true in general, yes.

Q. Who's Ronald Fisher?

A. Ronald Fisher.

Q. Sir Ronald Fisher?

A. Ronald Fisher is the greatest statistician who ever lived.

Q. Are you aware that he was retained as a consultant by the tobacco industry?

A. No, I wasn't.

Q. Both in Europe and in the United States?

A. No, I was not aware of that. Could well be true, I don't know.

MR. EDELL: Isn't that true, Mr. Northrip?

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MR. NORTHRIP: It's not my deposition, Mr. Edell.

MR. EDELL: I see. I'm sorry.

Q. Both in England and the United States. Did you know he was retained as a consultant to the tobacco industry in England as well as the tobacco industry in the United States?

MR. NORTHRIP: Asked and answered.

A. I know nothing about his consulting activities.

Q. Who is Dr. Berkson?

A. Dr. Berkson was a very prominent biostatistician from the Mayo Clinic for many years.

Q. Do you know his relationship to the tobacco industry?

A. No, don't know anything about it.

Q. You rely upon the writings of Dr. Fisher, do you not, sir?

A. Yes, I do indeed.

Q. And you rely upon the writings of Dr. Berkson, do you not?

A. I do.

Q. Any other statisticians that you rely upon?

A. Any other statisticians -- well, there is an

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article by Dr. Brownlee which I rely upon.

Q. Anyone else, sir?

MR. NORTHRIP: Do you want him to go through all those articles?

A. I think there are probably lots and lots of people here who are statisticians.

Q. What's a misspecified regression?

A. A misspecified regression -- it's a regression in which -- let's see if I can explain this properly.

I don't know what a misspecified regression is at the moment.

Q. You've heard the phrase, though, have you not, sir?

A. Oh, yes.

Q. What's a normal analysis of variance?

A. Well, analysis of variance. Well, an analysis of variance is a test of equality of meanings based upon more than two random samples. And do you want me to describe how to do it? I mean, it's --

Q. No, that's okay. How do you use the term, correlation, sir, in statistics?

A. Well, a correlation is one sort of association between two variables.

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Q. What kind of an association?
A. Well, if you take a set of numbers, X, that's one, X one down to XN, and another set of numbers, Y, which are measurements on the same item as you're taking these set of items you're taking on the Xs, the most usual correlation coefficient is -- it's the sum of XY minus the sum of X times the summation of Y, divided by the square root of summation X squared minus summation X quantity squared times the square root of summation Y squared minus quantity summation Y squared.

And I'm sorry for that, but that's what it is. It is the standard measure of association between two sets of observations.
Q. Is there a correlation between cigarette smoking and lung cancer, sir?
A. There is a correlation, and it is generally measured, though, by relative risk in the literature, but yes, it's fair to say there is an association.

There are several ways of measuring the association. One is that particular correlation coefficient, relative risk is another, and there are some other ones, too, that aren't

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used so much.

Q. And there's a correlation between cigarette smoking and heart disease, correct?

A. There would be, yes.

Q. Is there a correlation between cigarette smoking and any other diseases?

A. Oh, I believe so. The Surgeon General's reports have identified positive relative risks between cigarette smoking and a number of other diseases, and if those sorts of studies were done with a different kind of measurement, they would show positive correlations, certainly.

Q. And when you say positive correlations, you're talking also about positive associations?

A. Yes, positive correlation is one measure of a positive association. It's like relative risk greater than one.

Q. Cigarette smoking is a risk factor for lung cancer, correct?

A. Yes.

Q. And cigarette smoking is a risk factor for heart disease.

A. Um-hum.

Q. And what other diseases is cigarette smoking a risk factor for, sir?

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A. It's a risk factor for all of those diseases given by the Surgeon General which have relative risks greater than one.

Q. Do you know what they are, sir, what those diseases are?

A. Oh, we could very easily check this out. They are diseases such as, oh, let's see, there are various other sorts of cancers on the list and, let's see, I'm thinking of what kinds of cancers those are, cancer of the esophagus, cancer of the stomach, and some other ones, but the details escape me.

Q. You've reviewed the epidemiological and statistical literature with regard to cigarette smoking and diseases in human beings, have you not, sir?

A. Yes, I've done that.

Q. And you've been aware of that literature for a long time, have you not?

A. Um-hum, I have.

Q. When was the first study that showed a positive association between cigarette smoking and lung cancer?

A. Well, people found positive associations by one or another measure. These were showing up in

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the literature before 1950. I don't really know how far back they go, although I've seen a reference to earlier studies. I haven't really read the earlier studies, and I don't know how good the earlier studies are.

The associations certainly show up in the literature in 1950 or somewhat before.

Q. And you're familiar with the literature with regard to the association between cigarette smoking and heart disease. When was the first time that such literature appeared?

A. Oh, I really don't know when that first appeared.

Q. Never made a study of that, sir?

A. Not the early cases, I haven't.

Q. You didn't consider the early cases, is that correct?

A. I think that some associations between cigarette smoking and heart disease would have shown up in the 1950s, but I really don't know whether they would have shown up before that or not.

Q. When you say some associations, you're talking about a positive association?

A. Yes, indeed, a positive association.

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Q. And that being that cigarette smoking was a risk factor for heart disease?

A. Um-hum.

MR. EDELL: Will you mark this for identification, please?

(Exhibit Clelland 4 marked for identification.)

BY MR. EDELL:

Q. Dr. Clelland, I'm showing you Exhibit Clelland 4 for identification. You've seen that before, have you not, sir?

A. Yes, I have.

Q. Did you see prior drafts of that document?

A. Let's see, June 11th, '87. Yes, there was one prior draft of this that I'm aware of.

Q. Did you make any changes on that prior draft, sir?

A. Yes, there were -- I made changes on it, and the changes had to do with the fact that I was told that questions about cardiovascular disease had entered the case, and was asked if I could do some testifying about that, and I said yes, and these -- some material near the end was added, I think. And I think the draft before this one may have had -- may have made a change or two in it at

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one point.

Q. Before I forget, who's Carl Seltzer?

A. Seltzer?

Q. Yes.

A. He's a -- I don't know whether he'd call himself an epidemiologist or not, but he certainly does epidemiological work, and he's based in Boston. I've read some of his papers.

Q. Do you know his association with the tobacco industry?

A. No, I don't.

Q. Did you retain the prior draft of Clelland 4 for identification that you had seen?

A. I think so. I'm not positive. I think I probably have that somewhere.

MR. EDELL: I don't think we got that, either.

MR. O'NEILL: Off the record?

MR. EDELL: I'd like to stay on the record if we're going to make statements as to the existence or nonexistence of documents.

MR. O'NEILL: I'll repeat it on the record, just for clarification --

MR. EDELL: Let's go off the record.

(Discussion off the record.)

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MR. EDELL: Let's go back on the record.

A. I was referring to a previous version of an expert report, previous expert report, if you like.

Q. Did you provide anyone with information in order for them to prepare this report, sir?

A. Let's see, the substance of this report, I discussed on several occasions before it was prepared with Mr. O'Neill.

Q. But he never prepared you with any writing -- he never provided you with any writings prior to this previous report, is that correct?

A. Any written form of it -- no, I think not. What we did, after discussing it on a couple of occasions, I don't remember how many occasions, we agreed on what the contents were to be.

This document and the previous expert report were typed, I guess, in Kansas City, and when they were typed, Mr. O'Neill read me this document, I might say, rather slowly and carefully over the telephone, and I agreed that it would be an appropriate statement for me to make.

Q. Are there any additional opinions, sir, that you have in regard to this case that you have not

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already expressed in this deposition, that are not contained in Clelland 4 for identification?

A. I don't think of any at the moment.

Q. Can you take a look at the second page of Clelland 4? Actually it starts on the first page, "Dr. Clelland is of the opinion that the reported statistical association between cigarette smoking and lung cancer should not be interpreted as establishing causation."

Do you see that, sir?

A. Um-hum.

Q. How should the reported statistical association between cigarette smoking and lung cancer be interpreted?

A. Well, it should be interpreted as an association, that is, as a clue. It turns up many times in many different studies, and it should give impetus to biological, medical, genetic work, which would check out whether or not the association is truly causal.

Q. Are you aware of any biological work done in order to determine whether or not there is a causal relationship between cigarette smoking and disease in human beings?

A. I'm aware that geneticists and others are

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greatly interested in determining the cause of cancer generally, and of lung cancer in particular, and that many people are working in this area.

I am not terribly familiar with all of the medical, biological and genetic work on cancer. So would you give me your question again? I've wandered a bit.

MR. DECKER: Can we have the question read back?

(The record is read back.)

A. Cigarette smoking and disease, I think there are many many investigators working on this problem because I see articles coming out all the time in the medical and biological literature that relate to it. As far as I know, the association remains an association at this point.

Q. Has anyone discovered any carcinogens in tobacco smoke?

MR. NORTHRIP: Object to the form.

A. People have identified substances in tobacco smoke which have appeared to act as carcinogens in, oh, for example, when applied to animal skin. So I think it's fair to say that people have identified in cigarette smoke small quantities of

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substances which, in different situations, appear to cause cancer.

Now, I ought to watch that word cause, because I'm not terribly well up on all of the skin painting experiments and that sort of thing.

Q. Has anyone ever identified any metagenetic effects of cigarette smoke?

MR. DECKER: Object to the form.

MR. TUCKER: Object to the form.

A. Metagenetic effects -- I think so in animal experiments, I think metagenetic effects have been identified.

Q. Are there any substances that you're aware of that have been identified as having metagenetic effects on human beings?

MR. DECKER: Object to the form of the question.

A. Metagenetic effects in human beings -- I don't know.

MR. EDELL: Why don't we break for lunch. It's 12:30.

(Luncheon recess at 12:30 p.m.)

(Resumed at 1:30 p.m.)

BY MR. EDELL:

Q. Dr. Clelland, how do you define air

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pollution?

A. Air pollution would be the state of the atmosphere in which there would be some unusual and presumably unhealthy concentration of various chemical substances, such as NO2, SO2, ozone, various mineral elements.

Q. Upon what facts do you presume that sulfur dioxide is probably harmful?

A. Well --

MR. NORTHRIP: Did the doctor mention sulfur dioxide?

MR. EDELL: SO2.

MR. NORTHRIP: Sorry.

A. Well, there is quite a body of material on SO2 and if I could refer to this list, this 60-page document that the project did which summarizes the SO2 literature.

Q. Certainly, you can refer to any of that, sir.

A. And that would, I think, be -- it's paper number 27 on this list on Clelland No. 1.

Q. What evidence did you have that led you to conclude that sulfur dioxide was probably hazardous?

MR. DECKER: Object to the form of the

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question. I don't think he used the word, hazardous.

BY MR. EDELL:

Q. Sir?

A. Yes, I said that sulfur dioxide is commonly considered one of the pollutants, and as I said, this literature summarizing that document would be the basis for that statement.

Q. What type of literature, sir?

A. Journal articles of various sorts.

Q. Epidemiological studies?

A. Some, yes.

Q. Animal studies?

A. Animal studies on SO2, maybe a little but not much.

Q. What other type of studies?

A. Biological studies on the interaction of sulfur compounds and animals.

Q. I'm sorry?

A. In animals.

Q. And animals?

A. Yes, quite a lot of studies on sulfur compounds in animals.

Q. Well, any other types of studies on human beings?

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A. I think there is some epidemiological work, a lot of animal studies on this. I'll mention the name of Dr. Alarie who is one person having done a lot of work on sulfur dioxide.

Q. What about nitrogen dioxide, sir, what leads you to conclude that that may be harmful?

A. There's also literature on that, and there are summary articles, which are not cited in this list, and whose authors I cannot think of at the moment, that summarized the same sort of thing for nitrogen dioxide as this paper does on SO2.

I've read several such summary articles, but that would be something -- some years ago that I read those.

Q. What types of studies are we talking about, sir, epidemiological studies?

A. Epidemiology and animal studies.

Q. Is NO2 is mutagen?

A. I don't know whether it's a mutagen or not. I think it probably depends on the circumstances.

Q. If you inhale it, is it considered to be a mutagen?

A. I don't know.

MR. DECKER: Object to the form of the question.

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Q. Is there evidence to support that it is?
A. Mutagen?
Q. Yes, sir.
A. In humans?
Q. Yes.
A. I don't know.
Q. Can you take a look at Clelland 4, sir.
A. Clelland 4.
Q. Second page.
A. That is this one.
Q. June 11, 1987 report.
A. Yes, second page.
Q. Are there any deficiencies in your opinion in the American Cancer Society 25 State Study?
A. American Cancer Society 25 State Study, yes, there are.
Q. What are they?
A. Well, one of the main problems with that study has to do with the way in which the participants were selected, and they were selected in a way that statisticians would not advise.
Q. How is that, sir?
A. Volunteers going out and collecting data from people they knew.
Q. Anything else wrong with the study?

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A. Well, there are some good points to that study. And the conclusions based on it, of the causational nature, I would disagree with.

The next study -- in that study, they did collect data on a variety of other factors besides smoking, which is the difficulty with other studies. I don't think they made extended analyses of these.

As I recall, in that study, there would be some inconsistencies in the dose response relations that the authors found, but this has been principally objected to on the grounds on the way the data were collected.

Q. Are you aware of any epidemiological studies funded by the tobacco industry?

A. Funded by the tobacco industry.

Q. Council for Tobacco Research, if you find that more preferable.

MR. NORTHRIP: You mean other than the ones he participated in and testified about?

BY MR. EDELL:

Q. I'm sorry, regarding cigarette smoking and lung cancer.

A. I'm aware -- an epidemiological study?

Q. Yes, sir.

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A. No, I'm not.

Q. And you reviewed the epidemiological literature with regard to cigarette smoking and cancer carefully, correct, sir?

A. Oh, yes. This doesn't mean there aren't some, it simply -- I'm thinking of the major basic --

Q. You can continue.

A. I'm thinking about the major basic perspective and retrospective studies. I'm not -- I don't recall that any of those were funded through tobacco.

Q. With regard to the U.S. veterans study, what deficiencies did you find in that, if any?

A. Well, the Dorn Study, one of the problems with the Dorn Study, of course, is that its participants are veterans, and U.S. veterans, I believe primarily veterans with some World War I experience, and that makes that study quite unrepresentative of the population at large.

I think I have somewhere seen a copy of a paper by Dr. Sterling, who claims that he found misclassification problems in the Dorn Study.

Q. Do you know Dr. Sterling's relationship to

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the tobacco industry?

A. No, I don't.

Q. Any other deficiencies, sir?

A. Well, one deficiency that might be relative to this case is that it's a study of men, essentially. I recall very few women in that study, if any. Those are some of the points.

I suspect if I took a while, I could think of others.

Q. Do you know any epidemiological studies funded by the tobacco industry with regard to cigarette smoking and lung cancer in women?

A. No, I don't think I do. I don't think I'm aware of epidemiological studies funded by the tobacco industry. That doesn't mean that there aren't any, but I don't think I know of any.

Q. You made a careful examination of the literature, and if there were such studies, you would have seen them, correct?

A. No, not necessarily. I wouldn't look at every footnote and every attribution; and furthermore, if I had noted something like that, I probably wouldn't remember it. It's nothing I would pay much attention to.

Q. What's that, sir?

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A. The attribution in the funding, I wouldn't pay much attention to that.

Q. Are you aware of any epidemiological studies which had a sufficient number of women with regard to the hypothesis that cigarette smoking causes lung cancer in women?

MR. TUCKER: Object to the form.

A. Well, let's see, if I'm not mistaken, the American Cancer Society study that you previously mentioned has a large cohort of women, so that would be one.

Q. Any others, sir?

A. I think that the Japanese study that Dr. Hirayama performed, which is cited in this respect, was pretty much a population study and thus, had something on the order of half women in it, is my impression.

Q. Continuing with your report, you indicate that the epidemiological studies are, I guess, deficient in terms of the self-selection of the subgroups in terms of their smoking habits, is that correct?

A. Um-hum, that is correct.

Q. Upon what do you base that statement, sir?

A. Well, there is literature which shows that

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in various respects, smokers and nonsmokers differ in a variety of behavioral, emotional and indeed, physiological characteristics.

Q. What are those characteristics, sir?

A. Well, type of personality is one --

Q. What's the difference in the personality?

A. Well, that literature refers to a Type A personality.

Q. What does that mean?

A. Which means that the person tends to be more extroverted and more, what should I say, more excitable than persons in the Type B category, who tend to be more introverted, less excitable, and there are some other characteristics in those personalities.

Q. What are those?

A. The first one, more outgoing, the second one, less outgoing.

Q. Any other differences?

A. Oh, I'm sure, but those are the main ones.

Q. What are the other ones that you recall, sir?

A. Those are what I recall at this point.

There are studies, there are some of Dr. Seltzer -- we mentioned Dr. Seltzer earlier,

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Dr. Seltzer had done some work showing some difference in morphology, as he calls it, between smokers and nonsmokers, height, weight, various measurements of the individuals.

Q. Sir, are there people who believe that the differences in the personality cause people to smoke?

A. Differences in personality cause people to smoke --

MR. NORTHRIP: Can I hear that question back, please?

(The record is read back.)

MR. NORTHRIP: Object to the form.

A. I think there is some work that shows that before beginning to smoke, there are some identifiable characteristics that distinguish smokers from nonsmokers. I think that's a fair answer. So I suppose the persons that did those studies would hold that opinion.

Q. Do you have an opinion in that regard, sir?

A. I've read the studies.

Q. Okay. I understand that. Do you have an opinion as to whether or not the differences between the Type A and Type B personality affects whether or not a person smokes or not?

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A. It's a hypothesis. I don't think it's established. It's a perfectly decent hypothesis.
Q. What is your opinion, sir? Do you have an opinion as to whether or not there is or there is is not a relationship between the type of personality and one's initiation in the use of cigarettes?
MR. NORTHRIP: I object to the question being outside the scope of the expert report. But you may answer.
A. Let me think about that just a second. I don't have an opinion on that.
Q. Sir, do you have an opinion as to whether or not differences in the characteristics of smokers and nonsmokers results in a person's continuation to use cigarettes?
A. I think that, indeed, is another hypothesis which is a decent hypothesis, but is not established.
Q. What do you mean by a decent hypothesis, sir?
A. Tenable hypothesis in that I haven't seen any evidence to show that it could be abandoned, should be abandoned, but I haven't seen any definitive evidence to show that it has been

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proved once and for all.

Q. What evidence supports that hypothesis, sir?

A. Now, if I could have a restatement of the hypothesis, please.

Q. Sure, restatement of the hypothesis would be that there are certain characteristics of cigarette smokers that results in the continuation of the cigarette smokers' continuation of their use of cigarettes.

MR. NORTHRIP: Object to form.

MR. TUCKER: Objection to form.

A. I think there is, in the literature, some -- I think there are some studies in the literature that -- whose authors feel that their studies support that position.

Q. What other studies, sir? Tell me about it. That's what I asked you.

A. May I have the question for another time, please? I think I'm doing poorly on this question. Let's try it once more.

(The record is read back.)

A. I believe there are such studies in the literature and I believe that some of Eysenck's work would fall in that category.

Q. Any of the work performed by your colleague,

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Dr. Hickey, fall in that category, sir?
A. No, Dr. Hickey has not done experimentation on smokers, psychological or otherwise.
Q. Has done no physiological research either, is that correct?
A. Not that I'm aware of. I don't know much about Dr. Hickey's research before, say, 1960 or so.
MR. EDELL: When we take a break, it's always the one I can't find that I'm looking for. One more second and I'll continue.
MR. NORTHRIP: Take your time, Marc.
MR. EDELL: Excuse me?
MR. NORTHRIP: Take your time.
MR. EDELL: Thanks, Bob. I may have left it in the car. I'll pick it up after the next break.
BY MR. EDELL:
Q. Sir, does the difference in the characteristics of smokers and nonsmokers have an effect on the smoker's ability to discontinue their use of cigarettes?
MR. TUCKER: Object to the form of the question.
A. You're asking me for my opinion about that?

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Q. Yes, sir.

A. I don't think that's -- I don't think that's an area in which I am particularly expert. I think there is some literature that would support that point of view, but again, I don't think that's established, either.

Q. Has anything been established with regard to cigarette smoking, sir?

MR. NORTHRIP: Object to the form.

MR. TUCKER: Object to the form of the question.

A. I think you better rephrase that, because that covers everything in the world.

Q. Has anything been established with regard to the physiological effects of cigarette smoking?

MR. TUCKER: Object to the form of the question.

A. Physiological effects are outside of my area of competence.

Q. What's your understanding of physiological effects, sir, in the context of your response to that question?

A. Interaction of chemical substances with biological organisms.

Q. You don't know what effect cigarette smoking

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has on a human being, do you, sir?
A. Cigarette smoking has on the human being -- affecting the area of disease?
Q. Period. Do you know what effect cigarette smoking has on human beings, at all, any effect?
MR. NORTHRIP: Object to the form.
MR. TUCKER: Object to the form.
A. Well, presumably, it stains their fingers brown.
Q. Right. Anything else?
A. I don't know of any proven cause and effect relationship between cigarette smoking and any disease, which I think is the sense of your question.
Q. Well, it's not a disease if it stains your fingers brown?
A. No, but I think your question is basically a disease.
Q. My question is based upon your knowledge of anything that -- anything at all that cigarette smoking -- any effect at all that cigarette smoking has on human beings.
MR. TUCKER: Same objection.
BY MR. EDELL:
Q. Other than we've already established that in

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your opinion, it can turn people's fingers brown.
A. Well, I think that is not only my opinion, but I expect that that's generally established.
Now, let me think a little while about that if you'd like me to.
Q. Okay.
A. It's a very broad question. I don't know of any other things that I consider absolutely proven.
Q. Sir, has it been established that the constitution of the cigarette smoker results in the development of cancer?
A. No.
MR. TUCKER: Object to the form of the question.
A. No.
Q. What is the strength of association between the hypothesis that cigarette smoking causes lung cancer as compared to the hypothesis that the smoker's constitution results in lung cancer?
A. I don't know. The reason I don't know is that I haven't seen statistics on constitution that are in the same form of statistical measures as the ones on smoking.
Q. Have you ever performed such statistical

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analysis, sir, with regard to the constitutional theory?

A. With regard to the constitutional theory -- are you asking me if I've ever performed an experiment which directly tests the constitutional theory?

Q. I thought that you were going to express an opinion with regard to the constitutional hypothesis, and I want to know whether or not you've ever done any research with regard to the constitutional hypothesis?

A. Well, the research that I have done does not include any experimentation or any analyses of smoking data that I have done, personally.

Q. Have you done any statistical analysis of other research performed by other individuals in regard to the constitutional hypothesis?

A. The only research I've done that is relevant to the constitutional hypothesis at all is the work that I've done in this series of projects with Dr. Hickey, and the conclusions that we've come to from that are that there's some evidence that air pollution is a hypothetical possibility for the causation of lung cancer, and that's not directly responding to your question.

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Q. I understand that.

A. Okay, well --

Q. Can you directly respond to my question?

A. Can I have it again, and I'll try.

Q. All I want to do is find out whether or not you've done any statistical analysis with regard to any research performed concerning the constitutional hypothesis.

A. Well, the research that we have done on air pollution only suggests that here is another possible cause. Outside of that, the answer to your question is no.

Q. Another possible cause being what, sir, the person's constitution or air pollution?

A. Both, smoking, variety of possible causes.

Q. And what is the strength of association in those studies that you found between air pollution and lung cancer, the constitutional hypothesis and lung cancer, and cigarette smoking and lung cancer?

A. As far as air pollution is concerned, we found that in one or two studies, the correlation coefficient was in the neighborhood of .7, which is -- this is between air pollution and lung cancer mortality. And I think this first occurred

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in that I triple E paper in 1970.

There is no such figure that relates to the constitutional hypothesis, because there haven't been -- the constitutional hypothesis hasn't been formulated in a way that allows that sort of testing, and indeed, those sorts of statistics haven't been computed by anybody, as far as I know.

Q. So is what you're saying, no one has ever done an epidemiological study to prove or disprove the constitutional hypothesis, is that correct?

A. I think that's correct.

MR. DECKER: Object to the form of the question.

BY MR. EDELL:

Q. Can such a study be done, sir, given the current state of epidemiology?

A. The proof of the constitutional hypothesis, and there are many forms of the constitutional hypothesis, the proof of any of those forms would be a matter that would rest in an area of biology and genetics, not in the area of statistics, which is true in the other possible causes of lung cancer.

Q. Do the by-products of cigarette smoke

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constitute part of the atmosphere, sir, that we breathe?

MR. DECKER: I object to the form of the question.

A. By-products of cigarette smoke -- am I missing something other than the smoke, itself?

Q. Let me rephrase the question. Is cigarette smoke part of the atmosphere which we breathe?

A. It is certainly part of the atmosphere that some people breathe, the smokers, and those around them.

Q. What if any steps did you take in your study to ensure that that fact was not a confounding -- did not have a confounding effect on your results?

MR. DECKER: I object to the form of the question.

A. Yes, that's a good question, and --

Q. First one.

A. -- let me respond. We started out those studies looking at air pollution in the form of chemicals, essentially, SO2, NO2 and various forms of metal.

These studies were based on data taken from -- mostly from Government publications, based

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on SMSAs, Standard Metropolitan and Statistical Areas.

Those were the units which we used in all of our work, the SMSAs.

We tried quite hard to get good data on smoking by SMSAs and we never could find any. If we had found data on SMSAs in measuring smoking in some way, even measuring things like total expenses for cigarettes, some of which data are available on a state basis, we could have gotten any sort of data on the basis of Standard Metropolitan and Statistical Areas, we would have included it. We were never able to find anything that would do that.

Q. So you didn't factor out what impact cigarette smoking in the atmosphere had on the results of your study, is that correct?

A. We were not able to. We looked at various of these air pollutants, as I've characterized them, and we looked at socioeconomic factors, and in some of the later studies, we looked at radiation.

We were able in all of these cases to get pretty good data on SMSAs. We could not get any sort of decent data on SMSAs.

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Q. When you say these chemicals and metals, are some of these chemicals and metals that you studied produced as a result of the burning of cigarettes?

A. Yes, that's possible.

Q. Can you tell us what the chemicals and the metals that are produced as a result of burning of cigarettes?

MR. DECKER: Object to the form of the question.

A. Well, one chemical that comes to my mind is arsenic. I believe there are low concentrations of arsenic generated by cigarette smoking, and arsenic is one of the atmospheric chemicals that were used in those studies.

I think also, I'm not exactly sure of this, because I haven't looked at it for a long time, I think there also are portions of SO2, sulfur dioxide, that are in cigarette smoke.

Q. And SO2 is probably a health hazard to humans, isn't that right, sir?

MR. DECKER: Object to the form of the question.

A. SO2 is one of the chemicals that turns up a good deal in our atmospheric studies, and we think

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it's well worth watching that. Yes, to answer your question, yes.

Q. Upon what facts do you base your answer that SO2 is probably a health hazard to human beings?

A. The -- primarily on the extensive literature reviewed in the document I have previously cited, and shall I give you the number again?

Q. Is it 33?

A. Something like that. No, it seems to be 27.

Q. 27.

A. And upon that literature and upon the fact that in our statistical studies, we got results that, again, to pick this one out as one of the things making the largest contribution to variance reduction.

Q. Would you compare for us, sir, the strength of association between SO2 and lung cancer as compared to cigarette smoking and lung cancer?

MR. DECKER: Object to the form of the question.

A. Well, it's hard to do because most of the -- I'm thinking of our studies on air pollution, where that relationship is described by correlation coefficients and coefficients of determination, and those don't compare directly

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with the relative risk estimates that are used in practically all of the cigarette smoking studies.

Q. Is it your testimony --

A. But let me just go a little bit further, here.

We found that we could explain somewhere on the order of 70 percent of the variance in lung cancer mortality statistics and SMSAs by air pollution or some combination of air pollution and water hardness and socioeconomic factors.

Now, you make the very good point that we did not include anything on smoking in that; hence, if we had included smoking, there would have been some unknown amount of reduction in those figures around .7.

Now, I don't know, I don't think there's any way of translating the coefficient of determination measurements into relative risks, so I really can't make that comparison.

I can say that the figures we found, which don't include cigarette smoking, showed a higher proportion of explained variance than you get in lots of other areas. Some other areas that I'm familiar with, where you're predicting things

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by regression equations, if you explained 40 percent in variance, that's pretty good.

Also, it's true that in the cases of certain other diseases, certain other forms of cancer, leukemia, for example, our data didn't explain anything like 70 percent of the variance, explained maybe 30 percent of the variance.

So we did a lot better in predicting variance in lung cancer than we did in something like leukemia.

But I think I'm being too long here. In any case, I can't compare the relative risk measures directly with the coefficient of determination measures.

Q. Let me make sure I understand, sir, you cannot compare for us the strength of association between cigarette smoking and lung cancer as compared to the strength of association between air pollution and lung cancer, is that correct?

A. Can't do that because they're measured in different ways.

Q. On Page 3 of your report, it says that you are expected to testify concerning the Surgeon General's criteria for inferring a causal relationship. Do you see that, sir?

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A. Um-hum, that's the beginning of the first full paragraph on that page.

Q. That's correct. You think the Surgeon General's advisory committee's criteria were incorrect?

A. I thought that they were not good criteria for establishing causality.

Q. What better criteria existed for establishing causality in 1964?

A. I don't think that there was any set of criteria that had been established for this purpose before 1964. I think this was the first serious crack at such a job.

Q. Let me ask you this, sir, if you were retained as a consultant to a company that manufactured cigarettes, and you saw the results of the epidemiological studies in the 1950s, would you have advised your client that there was a significant likelihood that their product caused lung cancer?

MR. TUCKER: Object to the form.

MR. NORTHRIP: Could I hear that question back, please?

(The record is read back.)

MR. NORTHRIP: Object to the form of

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the question unless there's more specificity as to what epidemiological studies you're talking about.

BY MR. EDELL:

Q. Sir, you can answer.

A. I think the substantial likelihood, I don't know. It's difficult --

Q. Significant likelihood?

A. Significant is worse because that's a statistical term, and the answer to that would be clearly no, because there hadn't been any studies showing statistical significance.

Substantial is harder for me to deal with. In the first place, I have some difficulty placing myself back in the 1950s. I think I would have advised the cigarette company that this was worth looking at; that there were statistical relationships there. I don't know what I would have said about substantial. I do know what I would have said about significant.

Q. Let me ask you this, sir, let's say tomorrow, a manufacturer of a product came to you and said, here's epidemiological literature that shows the same results that the epidemiological literature reflects for cigarette smoking and lung

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cancer --

A. In 1964?

Q. Correct.

MR. NORTHRIP: I object to the form of the question.

Q. And they asked you, do you think it would be wiser for us to place the product on the market or to conduct additional research before we marketed the product, what would you respond?

MR. DECKER: I object to the form of the question.

A. I have no idea what I would respond. I can think of a whole spectrum of possible responses, depending on the information. I can't answer that.

Q. You've never been asked by a manufacturer to advise them with respect to the advisability of marketing a product, is that correct, sir?

A. That's correct.

Q. Do you think that a company back in the 1950s, a cigarette manufacturer back in the 1950s should have sponsored epidemiological studies?

A. I have no opinion about that.

Q. You've reviewed all the literature, haven't you, sir?

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A. I've read a lot of literature, yes.
Q. And you don't have an opinion as to whether they should or shouldn't have done that?
A. That's right, I don't.
Q. Let's continue down on Page 3, sir. Have you relied upon Death Certificates in any of the statistical studies you performed?
A. The mortality rates from lung cancer and other diseases that are published by the Federal Government are based, to at least some extent, on Death Certificates. So the answer is yes.
Q. It's just a very simple question, sir. The studies that you performed, the statistical studies that you performed, did they rely in any way upon Death Certificates?
A. Oh, yes, they do.
MR. NORTHRIP: Would you read the question and answer back before, please? Because I believe he answered the question the first time.
(The record is read back.)
BY MR. EDELL:
Q. In what way, sir?
A. In the way that I previously stated, in that the mortality rate data from the Federal

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Government relies, at least in part, on Death Certificates, and we used that data in these studies as essentially the available source of our mortality by SMSA.

Q. And you consider that a deficiency in your study, correct?

A. Yes, indeed, I do. It would be much better if we had had data that had been completely checked by pathological examinations of one sort or another.

Q. Why didn't you go ahead and do that, sir?

MR. TUCKER: Object to the form.

A. Because I'm a statistician, and we had no funding for studies of that magnitude.

Q. Well, you weren't the only one who was conducting the study, is that correct?

A. That's correct.

Q. There were people with expertise in different areas who participated in your studies, correct?

A. Correct.

Q. You could have gotten a pathologist to participate in the study, correct, sir?

A. Studies were not -- we never made a proposal for that sort of a study.

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Q. You didn't think it was necessary, did you?

MR. DECKER: Object to the form of the question.

A. It was not work which I would have been particularly competent to perform.

Q. No, you never asked for -- you never submitted a grant proposal which would have included as part of it work performed by a pathologist to give you the underlying data, is that correct, sir?

A. Let's check that a bit. The data that we were using in our studies was data on 48 or so SMSAs across the country. There is no way that we could have mounted a data collection operation of that magnitude.

Q. Why is that, sir?

A. A national study checking Death Certificates across the country? It's far beyond the scope of a four- or five-person activity in which maybe one person was full time and everybody else was much less than half time.

Q. Did you ask the Council for Tobacco Research for funding to perform such a study?

A. We did not, and in my opinion, if we had, they would have said the scope of such a project

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far exceeds the capabilities of this group.

Q. There are pathologists at the University of Pennsylvania, are there not, sir?

A. There are indeed.

Q. And you could have added one of the pathologists or two of the pathologists or three of the pathologists at the University of Pennsylvania to your team, could you not?

A. I have no idea whether I could have or not.

Q. You made no attempt to do that, did you?

A. That's right, no attempt, because we were not doing that sort of work.

Q. Are all valid epidemiological studies based upon pathological review and confirmation?

MR. DECKER: Object to the form of the question.

A. It's a question of what is meant by valid epidemiological studies. If you're talking about -- if you mean by valid epidemiological studies, studies that are correctly performed and reach conclusions about data and populations, you don't need pathologists in those studies, provided that they're based on data which have been properly validated.

On the other hand, if you are doing

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studies that involve checking Death Certificates, it would be highly desirable to have a pathologist on board, and to have, in fact, a pathologist examine all the Death Certificates that would be used in the study.

I have run across quite a bit of literature which indicates that pathologists oftentimes differ, one from another, on how they read their slides, and that suggests that a pathologist on such a study is better than several pathologists.

Q. Sir, on Page 4, you continue to talk about your criticisms of these different epidemiological studies, and you say that they did not take occupational exposures into consideration. Do you see that?

A. I'm looking for it.

Q. First paragraph, Page 4.

A. Without adequate attention to other factors including occupational exposure, yes, I see that.

Q. Are you aware of epidemiological studies which look at the relationship between cigarette smoking and lung cancer which, in fact, took into consideration occupational exposures?

A. Yes, there are some of those.

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Q. And what studies are you referring to?
A. Let's see, occupation -- well, Dr. Sterling's work is in occupation, the California study, one of the basic studies, prospective studies of the Surgeon General's report cites the one done through labor unions was aimed primarily at occupational, the British doctors' study.
Q. And the results of these epidemiological studies that took occupation into consideration came out with similar conclusions with regard to the statistical association between cigarette smoking and lung cancer, isn't that correct, sir?
MR. DECKER: Object to the form of the question.
A. I suspect that they came out with somewhat different results in various studies, somewhat different.
Q. Statistically significantly different, sir?
A. Different, and since most of these aren't based on randomization, statistical significance doesn't really have meaning in those studies.
Q. What was the strength of association between cigarette smoking and lung cancer in those studies as compared to epidemiological studies which did not take occupation into consideration?

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A. Shall we try it study by study?
Q. Try anything you like.
A. Well, in the study that I mentioned in California, the occupational study, the -- most occupations did not show any considerable relationship with lung cancer mortality. One or two did. And which two or three those were escapes me at the moment, but most occupations did not.

The studies showed a stronger relationship between cigarette smoking and lung cancer than either all or almost all of the occupations. I forget whether one of those was up at the same level or not. That's one.

Q. Are you familiar with Dr. Selikoff's studies?
A. Dr. Selikoff, let's see, do I relate him to asbestos? I've read material of which he was an author.
Q. Did he take occupational exposures into consideration when determining what if any relationship cigarette smoking had to causing lung cancer?

MR. DECKER: I object to the form of the question.

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A. Could you tell me what study you're referring to? I think he's done several studies.

Q. Whatever studies you've read, sir, you're the expert on this, not me.

A. Well, I would like to have reference to a particular study, and then I can comment.

Q. Any particular study by Dr. Selikoff you prefer. You can limit yourself to one study. Tell us about any one study you want.

A. Well, let's see, Selikoff -- if I had a particular study I could look at, I'd be able to comment on it. I have difficulty commenting on something when I don't know exactly what study it is.

Q. Is that your response, sir?

A. Yes.

Q. You don't recall any particular Selikoff study?

A. I've read Selikoff studies. I have difficulty responding to the question without knowing what exact thing it is we're talking about.

Q. We're talking about cigarette smoking and lung cancer, sir.

A. What particular study are you talking

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about?

Q. Any of the studies. Do you recall one study performed by Dr. Selikoff?

A. I don't recall specific details of one study performed by Dr. Selikoff. I have read studies which Dr. Selikoff was author or co-author, and if I had such a study before me, I could comment on it in some detail.

Q. The next paragraph says that Dr. Clelland is expected to testify that based on his review of the literature, he is unaware of any reported statistical association between atypical carcinoid tumors and smoking in men or women.

Do you see that, sir?

A. Yes, that's the second paragraph.

Q. How do you define atypical carcinoid tumors?

A. Well, again, the definition of atypical carcinoid tumors is a matter really for biologists to define.

Let me give you a general answer. My general --

Q. No, I want to know how you used it in the context of your opinion in this case.

MR. NORTHRIP: That's what this doctor is starting to give you. Please don't interrupt

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his answer.

MR. EDELL: No, no, he said he wasn't answering my question, counselor, he was telling me what he couldn't do.

A. I was making a --

MR. NORTHRIP: Just a moment. Would you read his answer back, please?

(The record is read back.)

MR. NORTHRIP: And you interrupted him and I assume he was starting to give you an answer.

BY MR. EDELL:

Q. I don't want a general answer, sir. I want to know how Dr. Clelland used or defined (quote) atypical carcinoid tumors (close quote) in reaching his conclusion that he was unaware of any reported statistical association between such tumors and smoking in either men or women.

A. I will tell you. It is my understanding that experts in the field have defined a spectrum of something they call neuroendocrine tumors of the lung. And it is my impression from reading this literature that at one end, a very malignant end of the spectrum is small cell cancer, and at the other end is typical carcinoid, which is a

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much less malignant type of tumor.

From my reading, I gather that in the intermediate part of this spectrum, there is a type of neuroendocrine tumor which at least some experts classify under the name atypical carcinoid. So I used this term to represent an intermediate form of cancer in terms of malignancy, lying on a spectrum between small cell cancer and typical carcinoid.

I am saying my impressions of the material that I read, and I also know that various pathologists have proposed various names and various categories for tumors in this spectrum, and I gather that there is some debate about the nomenclature, and that's why I hesitated to say atypical carcinoid. I know what it means.

Q. I'm not asking you to tell me what it means. I wanted to know what it means in the context of your opinions in this case?

A. That's what it means to me. It means to me intermediate form in the terms of malignancy between those other two types.

Q. And where did you get that definition from, sir?

A. From reading the literature.

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Q. What literature?

A. The literature on neuroendocrine tumors that's in this list.

Q. Show me which article or articles that define neuroendocrine tumors -- I'm sorry, atypical carcinoid tumors in the manner in which you've defined.

A. Okay. Well, the first -- it happens that the very first article on the list, Arrigoni's article was about the first one I've seen in the literature that dealt with something called atypical carcinoid, and from my reading of the literature, most other authors start out by referring to this article.

Now, I'll go down the list and see what else I can find on the subject of atypical carcinoid.

Here is --

Q. No, no, I don't want to know what items are on the list that deal with atypical carcinoid, sir. I want to know what articles on the list define atypical carcinoid as --

A. In the way that I have.

Q. -- that's correct, is it your testimony that Arrigoni defined it like that?

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A. I think not exactly that way.

Q. I want to know the articles --

A. I don't think the idea of a spectrum was present in Arrigoni's work.

Q. Tell me the article that you relied upon for your definition, sir.

A. Okay, let me look.

Q. For atypical carcinoid.

MR. NORTHRIP: Allow him to answer your question, please.

MR. EDELL: I would like for him to answer the question, Mr. Northrip. I would welcome that.

MR. NORTHRIP: I would appreciate if you would stop badgering and allow him to answer the question without interruption.

MR. EDELL: I'm not badgering him, Mr. Northrip.

MR. NORTHRIP: That's your characterization. In my opinion, you are.

A. All right, let me find two or three here which would go along with that. I think the article by Carter, number 21 on this list, using your nomenclature, would do that. I'm skipping a number of these trying to look for sort of the

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major ones.

Q. No, I want to know all of them, sir, that define atypical carcinoids in the way that you do. Do you understand that?

A. I understand it. I don't know as I'm going to be able to answer all, but I'll try to find some. And I'm sorry if I have to go through the list this way.

Q. It's okay. Take your time.

MR. NORTHRIP: Mr. Edell requested it.

Q. Take your time.

MR. NORTHRIP: When we get an answer to this question, I'd like to break, please.

A. I believe number 74 and 75, that Dr. Gould would use this definition.

Dr. Mark, in number 121 would use that definition. And Dr. Paladugu in 135, although he has a different nomenclature. He has essentially this arrangement, but he calls them by different names.

Well, not to take your time, let's say I rely upon those.

MR. NORTHRIP: Well, go through, and Mr. Edell asked you for all.

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MR. EDELL: Absolutely.

THE WITNESS: All right.

A. Which was the last one I gave you?

MS. WALTERS: 135.

MR. NORTHRIP: Dr. Pala --

A. Paladugu. Dr. Todd in 176 would use a similar definition. Dr. Wilson in 192 would use a similar definition. He's dealing with a single case, here.

Let's say I relied upon those.

Q. Let me just ask two more questions before we break, Mr. Northrip. For the purposes of your opinions in this case, sir, do you consider atypical carcinoids to be a different type of tumor than small cell cancer?

A. A different type of tumor -- let me answer it this way, and indeed, you're asking me biological definitions, here, but I'll give you my understanding.

My understanding is that experts now talk about neuroendocrine tumors as a class, and within that class, it's my understanding they talk about atypical carcinoids as a subclass.

Q. All I want to know, sir, for the purposes of your consideration of this matter, did you assume

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that atypical carcinoids were different than small cell cancers?

A. Yes, I believe that they are a subclass within the larger class of neuroendocrine carcinomas, and I based that upon reading and not upon my expertise as a statistician, obviously.

Q. For the purposes of your considerations in this case, did you consider atypical carcinoids to be a different type of tumor than typical carcinoids?

A. I did, same reason.

Q. And in what way did you consider atypical carcinoids to be different than small cell cancers for the purposes of your considerations in this case?

A. For the purposes of my considerations, it seemed to me, from the literature, that atypical carcinoids were thought to be less malignant than small cell cancers, and that this is expressed, at least in one way, in that patients have a longer expected life span, after discovery of an atypical carcinoid in a lung, than after discovery of a small cell cancer in the lung.

MR. EDELL: Why don't we accommodate Mr. Northrip and take a break.

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MR. NORTHRIP: Thank you.

(Recess at 2:40 p.m.)

(Resumed at 2:55 p.m.)

BY MR. EDELL:

Q. Doctor, did you define atypical carcinoids for the purpose of your opinions in this case pathologically?

MR. O'NEILL: I object to the form of the question.

A. I didn't really define them. I gave the definition that I found in the literature in the various papers that I referred to, and some of those gentlemen who did define it are certainly pathologists. So I'm essentially repeating what I believe I found in those papers.

Q. You evaluated the tumors in the literature that you reviewed depending upon their malignancy as to where they would be placed in the spectrum, is that correct?

MR. DECKER: Objection to the form of the question.

A. I don't think I placed tumors in any spectrum at all. I read what had been done in the literature by experts in this area.

Q. Do you have a pathological definition for

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atypical carcinoid, sir?
A. I have no other definition than the one I gave.
Q. And that is there's a spectrum of neuroendocrine carcinomas, one end are tumors, one end, you find small cell cancers, right?
A. Yes.
Q. The other end, you'll fine the typical carcinoid, is that correct?
A. Um-hum.
Q. And somewhere in the middle, you'll find an atypical carcinoid?
A. A class of atypical carcinoids. That's my understanding of what these experts are saying.
Q. Could you draw that out on a piece of paper for me, please, the spectrum that you're referring to?
MR. DECKER: I object to the form of the question.
(Witness complies.)
A. That's not very elegant, but that's my understanding of that spectrum.
MR. EDELL: Could you mark that, please?
(Exhibit Clelland 5 marked for

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identification.)

BY MR. EDELL:

Q. Sir, how do you know where the line between typical carcinoid and atypical carcinoid begins?

A. I have no idea.

MR. DECKER: Object to the form of the question. This man is a statistician, not a pathologist.

Q. How do you know where the line between atypical carcinoma and small cell cancers begin?

A. I do not know.

Q. How did you make that determination for the purposes of your conclusions in this case?

A. I did not make such a determination.

Q. The authors who you referred to previously, did they describe the tumors in terms of -- or define the tumors in terms of malignancy or in terms of pathology?

MR. DECKER: Object to the form of the question.

MR. NORTHRIP: That applies for all of us, correct?

MR. EDELL: You have it.

A. I would say both.

Q. Why did you choose only to use the term the

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degree of malignancy as a definition for atypical carcinoids?

A. Because that, I believe, is the spectrum that was used by these experts.

Q. Do you have --

A. I believe that was the basis of their spectrum.

Q. Do you recall reading in these articles a pathological description of the different tumors?

A. Yes, in some of those articles, there were very lengthy and detailed pathological descriptions of the tumors.

Q. Why did you choose not to use a pathological definition as opposed to the one that you gave us?

A. For two reasons. Primarily, because from my reading, the experts used this system based on malignancy as their primary spectrum. And secondly, because a number of those articles are full of pictures of cancers in detailed descriptions of pathology, which are far beyond any knowledge I have in those areas. I have no expertise whatever in terms of sorting out tumor types pathologically.

Q. What expertise do you have in evaluating articles on pathology?

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A. I have the ability to look at articles that discuss classification of cancer and understand what they say when they are defining classes in various ways.

Q. What training do you have in that regard, sir?

A. Statisticians are quite good at such matters of classification logic, I think.

Q. What training have you had, sir, in classification of tumors?

MR. DECKER: Object to the form of the question.

MR. NORTHRIP: Object to the form of the question. This doctor is not being offered as an expert on classification of tumors.

MR. EDELL: That's why I was quite surprised at the response.

A. I have no expertise in the classification of tumors pathologically. However, I am capable of reading what experts in that area say on the subject of things such as this and understanding it.

Q. You're referring to --

A. That diagram.

Q. Clelland 5?

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A. In its entirety.

Q. What did the experts say in terms of where or how malignant a tumor has to be before it becomes a small cell cancer?

A. I do not know. It seems to me that the experts could have some difference as to where those lines are drawn, and I will not testify as to exactly where those lines -- where these vertical lines appear on this diagram, what characteristics in the mind of a pathologist separates atypical from small cell.

I can testify on the general spectrum, here, one, two, three in this area of malignancy.

Q. What are the differences in the opinions, sir?

MR. DECKER: Object to the form of the question.

A. That's not my expertise.

Q. How do those differences of opinions affect your evaluation of the underlying data in this case?

A. They don't.

Q. Why is that, sir?

A. Now, we should be careful as to what underlying data you're talking about.

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Q. And whatever underlying data you relied upon for your statement that you are unaware of any reported statistical association between atypical carcinoid tumors and smoking in men or women.

A. In the literature I read, I found no such association -- now, if you'd give me your last question again, please.

MR. DECKER: Do you want to have it read back?

MR. EDELL: No, that's okay.

BY MR. EDELL:

Q. If there was agreement on the description of the different tumors, would that change your opinions in this case in any way?

MR. DECKER: Object to the form of the question.

A. Agreement on descriptions of the tumors, do you mean in the literature?

Q. Yes, sir.

A. I think my diagram is consistent with the literature as it stands. I think the pathologists might draw those vertical lines separating the classes in somewhat different ways, but I'm not competent to say where they would draw them. So I'm not saying that every pathologist would put

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every cancer in the same category.

Q. Let me ask you this question, sir; is there an association between cigarette smoking and small cell cancer in the literature?

A. Cigarette smoking and small cell cancer -- yes, there is.

Q. And is there a positive association, sir?

A. Um-hum, there is.

Q. And that means that the more cigarette smoking you see, the more small cell cancers you'll see, is that correct?

A. Or the more deaths from small cell cancer.

Q. The more deaths from small cell cancer. So it would be important to determine where a particular tumor fell in terms of the line between atypical carcinoid and small cell cancer to determine whether or not there was an association between that tumor and cigarette smoking, correct?

MR. DECKER: Objection to the form of the question.

MR. TUCKER: Objection to form.

A. In considering particular tumors in particular individuals, it's obviously important in which category they fall.

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Q. So if it fell to the right of the line which separates atypical carcinoids and small cell cancers, in your opinion, there is literature which shows an association between cigarette smoking and the tumor, is that correct?

MR. DECKER: Object to the form of the question.

A. Yes, I believe there is literature showing that sort of association.

Q. And it's your testimony that there's a dispute in the literature as to where this line actually appears on the spectrum, that being the line between atypical carcinoids and small cell cancers, is that correct, sir?

A. I'm not testifying as to where that line should be at all.

Q. I understand that.

A. I'm simply saying that I'm not sure that pathologists would all put it in the same place.

Q. There's a disagreement in the literature that you read, is that right?

MR. DECKER: That's not what he said.

A. I don't know whether there's a disagreement or not. I think that there are various -- that pathologists generally agree on that spectrum. I

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am not sure whether they agree or not as to exactly where those lines are placed, and I suspect that they would not all put them in the same place.

Q. And if the lines were not a complete separation between the types of tumors, but rather a more wavy line, would that change your opinions in this case, sir?

MR. DECKER: I object to the form of the question.

A. Well, again, I'm not going to testify about the pathology of this. I have read in the literature that some people consider this line that I've indicated by malignancy as a continuous spectrum, continuous spectrum, and if that's the case, then it would be possible to take the cancers lying on it and make them into 17 classes, if the pathologist had a pathological basis for doing that.

I simply can't testify as to what would happen if there were more classes intermediate to those two or where those lines ought to be drawn. I don't know.

Q. Let me ask you this question, sir. If tumors described in the literature as being small

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cell cancers were, in fact, in the portion of the spectrum that we've designated over here as atypical carcinoid, would your opinions in this case change in any way?

MR. DECKER: Object to the form of the question.

MR. NORTHRIP: Object to the form. That's so speculative, I --

MR. EDELL: Well, let me ask the doctor this question.

Q. I'll make it very simple for you, doctor. When did people first start designating tumors as atypical carcinoids?

A. The first paper I've seen on this is Arrigoni's paper. That was in the early seventies. I do not know whether the designation was used before that or not. That's the first I've seen it.

Q. So you don't know how tumors now described as atypical carcinoids were described prior to 1972, is that correct?

A. I don't know --

Q. You don't know whether they were described as small cell cancers, do you?

A. I know nothing about atypical carcinoids

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prior to Arrigoni's paper.

Q. So let me ask you, sir, to assume that prior to Arrigoni's paper in 1972, what is now referred to as atypical carcinoids were described as small cell cancers, would your opinions in this case change in any way?

MR. DECKER: Objection.

MR. NORTHRIP: Objection, hypothetical question.

A. I think I would have trouble answering the question without knowing what the basis would be for the classification.

Q. I'm asking you, sir, to assume that tumors which are presently described as atypical carcinoids --

A. All of them?

Q. -- prior to -- or a number of them, prior to 1972, had been described as small cell cancers, would that change your opinion in any way?

MR. DECKER: Object to the form of the question.

MR. NORTHRIP: Object to the form and to the hypothetical nature of the question.

MR. DECKER: I'm not even sure what it means.

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MR. EDELL: I think you know what it means, Mr. Decker.

MR. DECKER: No, I don't.

A. I don't see that it would at this point.

Q. So it's your testimony, sir, that if 90 percent of the atypical carcinoids in this spectrum had previously been described, that is prior to 1972, as being small cell cancers, your opinion in this case would not change, is that right?

MR. DECKER: Object to the form of the question. I think it misstates his testimony.

A. I think it's a very hypothetical question, and I've answered it as best I can.

Q. I understand that it's a very hypothetical question to your way of thinking.

A. I'm giving a --

Q. I'm asking a new question, sir.

A. Another question.

Q. If 90 percent of the atypical carcinoids that fall within this category, here, were, in fact, designated as small cell cancers prior to 1972, would it change your opinion in any way?

MR. DECKER: Object to the form of the question.

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MR. NORTHRIP: I think it's been asked and answered.

A. Maybe I should be a little clearer. My opinion is based upon the literature I've read, and based upon the literature that I've read, I do not see that old classifications would affect my opinion. I would think that the new classifications would have replaced anything in the older --

Q. Are you aware of any epidemiological studies, sir, prior to 1972, which described atypical carcinomas?

A. No, I am not. I think the Arrigoni paper is the first mention of atypical carcinoids that I have seen.

Q. You are relying, in part, on the pre-1972 epidemiological studies for your conclusion that small cell cancers are related or associated with cigarette smoking, isn't that correct, sir?

A. Yes, I have seen -- I believe I have seen literature -- now, wait a minute. Let me not jump into that one too rapidly.

I don't honestly remember what is the first date I've seen of papers relating small cell cancer to -- small cell cancer to cigarette

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smoking, but yes, I have seen some papers from before 1972, and specifically the Kreyberg work would be in that category.

Q. Sir, are you aware of any studies of atypical carcinoids to determine what if any relationship they have to cigarette smoking?

A. No, I'm not aware of such studies.

Q. Have you performed any such studies, sir?

A. No.

Q. Have you reviewed any data to come to any conclusions in that regard?

A. I've never seen any data from a study of atypical carcinoids. I've seen -- the only thing I've seen that involves anything like that is the material that Dr. Schuman threw together that we talked about earlier. That's the only data I've really ever seen on groups of smokers and atypical carcinoids.

Q. And you were disappointed in Dr. Schuman's conclusions based upon that data, is that correct, sir?

MR. NORTHRIP: Object to the form of the question.

MR. DECKER: Object to the form.

MR. NORTHRIP: Disappointed.

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BY MR. EDELL:

Q. Sir?

A. I thought that the methodology that Dr. Schuman used was inappropriate, let me put it that way.

Q. In what way was it inappropriate, sir?

A. It's my understanding that the data that were used were derived from the fairly large number of studies that appear in the literature, and I think some of the data were contributed by personal communication. Most of them, however, were taken from studies in the literature.

And these were, I believe, in all instances, not epidemiological studies, really, but case studies, which looked at a particular hospital, took cases from the records, and as part of that, looked at what smoking history might be in those records, and simply reported the cases together with, in some cases, whatever there was of a smoking history.

And that, of course, is a group of case studies, and not an epidemiological study at all.

Q. What if any conclusions can you draw from case studies, sir?

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A. I think case studies can give you clues and sometimes very good clues as to what work should be pursued in the future. They're very good at generating hypotheses and can be checked out.
Q. Was there anything in the materials that you reviewed from Dr. Schuman that suggested that there was not a relationship between atypical carcinoids and cigarette smoking?
A. That there was not? There were atypical carcinoids in some nonsmokers. I don't remember how many.
Q. What percentage, sir?
A. I don't remember.
Q. Are there some small cell cancers in people who don't smoke?
A. Are there some small cell cancers in people who don't smoke? I believe so.
Q. What's the percentage?
A. I don't know.
Q. Does that mean that there is not an association between cigarette smoking and small cell cancers, or in some people who develop small cell cancers that don't smoke?
A. No, it does not. Indeed, referring again to Kreyberg's work, that, I think, would be

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considered reasonable epidemiological studies, and he found a statistical association between small cell cancer and smoking.

Q. Sir, do you know whether or not, depending at what stage one observes a tumor, as to whether or not it would be described as an atypical carcinoid versus a small cell cancer?

A. I don't know anything about tumor staging.

Q. Would that be important in coming to your conclusions in this matter?

A. I don't know.

MR. TUCKER: Object to the form.

Q. Did you ever hear of the term, cell of origin?

A. Cell of origin -- yes, I have read about that term.

Q. What do you know about that, sir?

A. Not very much.

Q. What do you know?

A. I believe that there is one theory which suggests that a cancer originates in one particular cell, and that would be called the cell of origin.

However, when we get into this area, it's far beyond my competence, and I don't intend

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to testify about the biology of the development of cancer.

Q. If the theory of cell of origin is correct, sir, would that affect your opinions in this case as to whether or not there's a relationship between cigarette smoking and atypical carcinoids?

MR. TUCKER: Object to the form.

MR. DECKER: Object to the form.

A. Well, the theory of the cell of origin, I don't know -- I suspect that could be a very complicated theory, and I must say that I just don't know how to answer that question. I have no opinion on that.

Q. Are typical carcinoids malignant, sir, for the purposes of your definition in this case?

MR. DECKER: Object to the form of the question.

MR. EDELL: What's wrong with the form of the question?

MR. DECKER: I don't know that he has a definition of this case.

MR. EDELL: He's given us his definitions already.

A. Referring to Clelland 5, I believe that from

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my reading, most experts in the area would think that typical carcinoids possess a low, quite low degree of malignancy, but I believe they are definitely classified on the malignant spectrum at this point by anybody I've read.

Q. But so that for the purposes of your opinions in this case, you considered carcinoids to be malignant, correct?

A. Yes indeed.

MR. DECKER: Object to the form of the question. I don't think that states --

A. I considered them to be malignant with a low degree of malignancy.

Q. Are all typical carcinoids malignant for the purposes of your definitions in this case?

MR. DECKER: Object to the form of the question.

A. Are all typical carcinoids -- I think the answer to that is it depends upon a time element. It's certainly true that there are some typical carcinoids that show malignancy. Your question related to all carcinoids. I think that -- all typical carcinoids.

It's my impression from reading the literature that there are some typical carcinoids

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that have an extremely low degree, and that people can go on having typical carcinoids for many many many years without malignancy being diagnosed, and in fact, that it may well be that people die with typical carcinoids in them, never knowing that they've had them. I get that impression from the literature.

So I think there may be typical carcinoids that are not malignant in the sense that malignancy is never discovered or maybe never exists. But --

Q. Well, there's a difference between the two. It's your -- is it your opinion, sir, that some typical carcinoids are not malignant at all?

MR. DECKER: I object to the form of the question.

A. It's a question of the time spectrum.

Q. At any point in time, sir, at any point in time.

A. Well, if you got someone who is 30 years old and has a malignant -- and has a typical carcinoid, if they die at 40 from being run over with an automobile, it may very well be that the malignancy, if present, is undetectable. So I don't know the answer to that. I don't know

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whether, if that person lived to be 90, they'd have died of a carcinoid or not.

Q. So it's your opinion that you have to detect the malignancy in order for there to be a malignancy, is that correct?

MR. TUCKER: Objection to form.

MR. DECKER: Object to form.

MR. NORTHRIP: Objection to form.

A. It's my opinion that the detection of cancers in malignancy is beyond my ability to testify as an expert witness. But what I've said before, I believe, is true, that in general, typical carcinoids have a very low degree of malignancy.

Now, whether some typical carcinoids never express malignancy or not, or whether they might express malignancy if the people reach the age of 90, I don't know.

Q. Well, what did you consider for the purposes of your opinions in this case?

A. I considered the material in the literature that showed the typical carcinoids had a low degree of malignancy in them.

Q. Did you consider any of the literature -- strike that. Did you see anything in the

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literature which suggested that typical carcinoids were not malignant at all?

A. Yes, I saw some papers that I have read which said that back in the early days, and that's probably, I'm guessing, in the fifties or before, people considered them nonmalignant entirely.

It was a point in history where typical carcinoids were considered nonmalignant. But I believe that nowadays, all the experts consider them malignant, with a low degree of malignancy. As to whether some of them never show that malignancy, I don't know.

Q. Where do malignant carcinoids fit on the spectrum, sir?

A. Well, malignant carcinoids would enclose the two classes, atypical and typical carcinoids, all of those carcinoids on this spectrum I thought of as malignant.

Q. So all the spectrums in typical carcinoid on Clelland 5 and in category atypical carcinoid on Clelland 5 are considered, for the purposes of your opinions in this case, to be malignant carcinoids, is that correct?

A. That's true.

MR. DECKER: Object to the form of the

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question.

A. That's true, although as I said before, I don't know whether there might be some of the typical carcinoids that never express that malignancy within a lifetime. I don't know.

Q. Before you were retained as an expert by the cigarette companies in this case, sir, had you reviewed any literature to determine whether or not cigarette smoking related to any types of tumors?

MR. DECKER: I object to the form of the question.

A. Any tumor types -- yes, I had read some of that literature before being retained in this case.

Q. Had you reviewed that in the context of your performing research, sir?

A. I performed it in the context of the fact that being in the area of air pollution research, that that area obviously abutted upon the area of cigarette smoking and cancer, so I read some in that area as I went along.

Q. All right. Tell us what types of tumors are related to air pollution, since you've studied the subject.

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A. I don't think there is any literature relating tumor type to air pollution. I'm not aware of it if there is.
Q. I thought you said you studied that in the context of your performing your work?
A. No, no, that wasn't what I said.
Q. So you never studied the relationship --
A. No, just a minute. What I said was that in the course of the air pollution studies that we were conducting, because cigarette smoking was obviously a closely related area, I also read material in the cigarette smoking lung cancer rate.
Q. Are you finished sir?
A. Yes, sir.
Q. Prior to your being retained by the cigarette companies in this case, did you ever write a paper which related to a relationship between air pollution, cigarette smoking or any other agent to a particular type of tumor?
A. No.
Q. Let's take a look at the bottom of Page 4 on your report, here. "Dr. Clelland is expected to testify that he has reviewed statistical information on lung cancer death rates and tobacco

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consumption data."

Do you see that?

A. Yes.

Q. What tobacco consumption data did you review, sir?

A. Tobacco consumption data -- in some of the literature that I reviewed, there are materials of that sort, and I'm trying to think if I can pin this down to an exact paper or two.

Tobacco consumption data. I'm going to have trouble picking out the exact paper which has tobacco consumption data in it, but I've seen this.

Q. Maybe if you can take a look at Clelland 3 for identification, which was prepared with Shook, Hardy & Bacon, you can help us out in that regard.

A. I'll take a look, but --

Q. Maybe that's material that's not included in Clelland 3.

A. I don't know. I'd be willing to take a look. There are a number of papers that show cigarette consumption data; I think I'm going to have trouble pulling that out of this list, although I'm sure I could dig those graphs out of

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the literature if I had a little time.

Q. Let's take a look at Page 5, please, sir. "Dr. Clelland is of the opinion that cigarette smoking has been identified as one of many risk factors."

Do you see that, sir?

A. That is the second sentence in the first paragraph.

Q. That's a part of it, it's not the complete sentence?

A. First part.

Q. Can you tell us, sir, what the relative risk is of cigarette smoking in terms of cardiovascular disease?

A. Well, that depends a great deal on what the particular study is.

Q. Well, I want to know what your opinion is, sir, as to the relative risk of cigarette smoking and cardiovascular disease.

MR. NORTHRIP: You mean independent of a study?

MR. EDELL: He's an expert witness on the relationship if any between cigarette smoking and heart disease.

A. There are a number of studies that I've read

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in which the relative risks of various sorts of heart disease from smoking have been computed. Let me say that a number of studies have found positive relative risks over a spectrum, and I don't remember the exact relative risks in these studies.

Q. What is the spectrum, if you don't remember the exact relative risks?

A. Oh, I think they -- you're talking about a lot of numbers, here. They must -- a great many numbers, from -- I've seen numbers from the -- if the range from two up to seven. I'm not sure that there aren't numbers below and above that.

Q. And what is Dr. Clelland's opinion concerning the relative risk of cigarette smoking insofar as cardiovascular disease is concerned?

A. That there's a positive association been established in a number of studies.

Q. What is the relative risk, sir, in your opinion?

A. The relative risk depends upon the study, and I've given you the spectrum that comes out of the studies. I can only tell you what the studies have concluded, not any separate figure that I have.

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Q. You don't feel qualified to interpret the studies, is that correct?

MR. NORTHRIP: Object to that mischaracterization of his testimony.

BY MR. EDELL:

Q. All I'm trying to do is find out what your opinion is, sir.

A. My opinion is that there is a positive association between cigarette smoking and various forms of heart disease as shown in this literature.

Q. Let me see if I can go around it another way, maybe I can get it out of you this way.

MR. NORTHRIP: Object to the statement prior to the question.

MR. EDELL: I'll withdraw the statement and I'll ask the question as follows.

Q. What is the strength of association between cigarette smoking and heart disease?

MR. DECKER: I object to the form of the question.

A. The strength of the association, assuming that strength is measured by relative risk, is the number that I have seen in various studies ranging from two up to seven.

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Q. What does it mean, sir, when the relative risk factor is seven?

MR. DECKER: Object to the form of the question.

A. It means that -- it's a number that can be used comparatively, assuming the studies are properly done. It shows a higher degree of association than something that gives a lower relative risk. Absolutely, it doesn't mean very much at all.

Q. What is the relative risk of stress and heart disease?

A. Stress is one of the factors that some people believe is important in the causation of heart disease. I believe there are studies which show -- it's a positive but not very large association with stress, as measured in a whole lot of different ways.

Q. What does that mean in terms of relative risk, sir, one, two, three, five?

A. I don't recall, today, particular numbers that show relative risk for stress.

Q. Do you recall a spectrum, sir?

A. Not really.

Q. What do you recall, or have you told us

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everything you recall?

A. I recall that there are studies that examine stress in a whole lot of different ways, and that there is generally a positive relationship between these measures of stress and heart disease and mortality.

Q. How would you compare the strength of association between stress and heart disease to cigarette smoking and heart disease?

MR. DECKER: Object to the form of the question.

A. I think that varies a lot from study do study.

Q. Tell us how it varies and what it would be from study to study, then.

A. Well, I don't have the studies in front of me, so I would have great difficulty doing that.

Q. You can't recall, is that what you're telling us?

A. I don't recall the detailed numbers.

Q. Do you mean generally, sir, how the two compare?

A. I don't recall relative risks for measures of stress at all, as I've said, so I can't say how they compare.

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Q. How would you describe the relative risk of high blood cholesterol, sir, in terms of heart disease?

MR. DECKER: Object to the form of the question.

A. Various experts have proposed a hypothesis that this was a very important causative factor in various sorts of heart disease, and there's been -- there have been studies looking at this, and of course, the intervention trials are quite interesting in this regard.

Q. Do you want the question read back, sir?

A. Go ahead.

MR. EDELL: You can read back his answer, would you please?

(The record is read back.)

A. And you would find, for example, that in, oh, say Keys' studies and Rose's studies, this has been thought of as an important factor, and in Keys' work, for example, you get a positive or relative risk in some countries but not in all countries -- well, a much larger relative risk in some countries than in other countries.

Q. What is the relative risk, sir? What is the spectrum of relative risk?

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MR. DECKER: I object to the form of the question. In what?

MR. EDELL: We were talking about high blood cholesterol and heart disease, Mr. Decker.

BY MR. EDELL:

Q. You understood that, right, sir?

A. Yes.

MR. EDELL: Sometimes we lose sight of it.

A. I think it's about the same as the answer I gave to the question a little while ago, relative risks, I think, run mostly along the two, three or seven category from study to study. That, of course, is a factor in which there's been a great deal of interest.

Q. How much study have you done in the area of epidemiological studies concerning cigarette smoking and heart disease before you were retained as an expert in this case?

A. Oh, I've read some literature. I've read more -- I've read other items since I became involved in this case but, for example, I've read the Surgeon General's reports for years and years, and this is the topic in the Surgeon General's reports, and I have been following up reading

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generally. I'm sure I've read various times, back in the 1960s, literature on smoking and various forms of heart disease.

Q. Let me ask you the question, maybe I can be a little more clear. Have you ever conducted any research, sir, on heart disease?

A. In some of the studies with Dr. Hickey, we've used mortality from one or other form of heart disease as an independent variable, so the answer is yes.

Q. And did you find a correlation between air pollution and heart disease?

A. In some of the studies, yes.

Q. And these are the same studies that you did not factor out cigarette smoking, is that correct?

A. That is correct.

Q. Have you ever done any research, sir, with regard to cigarette smoking and heart disease before your being retained as an expert in this case?

A. Some of that research would have been before being retained as an expert.

Q. Some of what research?

A. That we just spoke of, the studies -- the air pollution studies.

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Q. And in the context of the air pollution studies, you did research concerning relationship with cigarette smoking and heart disease?

A. Um-hum, before being asked to testify as an expert witness.

Q. And you concluded that cigarette smoking was positively associated with heart disease, is that correct?

A. Not cigarette smoking.

Q. Cigarette smoking --

A. Air pollution.

Q. I thought you said you studied cigarette smoking and heart disease?

A. If the record says that, that's a mistake.

Q. So let's just make sure we're correct.

A. Because I --

Q. Prior to your being retained in this case, did you conduct any research with regard to cigarette smoking and heart disease?

A. The answer to that is no. I conducted research regarding relationship between air pollution and heart disease, and if I missed that before, I apologize.

Q. I could have misheard. I just want to make sure the record is correct.

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MR. NORTHRIP: You heard correctly.

THE WITNESS: I think I missed that one.

MR. EDELL: Want to take a short break, then?

MR. NORTHRIP: Okay.

(Recess at 3:45 p.m.)

(Resumed at 4:00 p.m.)

BY MR. EDELL:

Q. Doctor, can you turn, please, to Page 5, the second full paragraph?

A. The one starting, "Dr. Clelland is expected...."

Q. Most of them start that way, but yes, that one also starts that way.

A. Epidemiological studies -- yes.

Q. It says, these studies include the Multiple Risk Factor Intervention Trial and the Oslo study?

A. Um-hum.

Q. It's your opinion that these studies do not support an association between cigarette smoking and cardiovascular disease, is that correct?

A. No, that's not correct. There is in many studies an association between cardiovascular disease and smoking. These intervention studies

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are studies that are aimed at seeing if reduction in the risk factors, in fact, improves the mortality of persons in the studies.

So the association there -- and these studies really aren't aimed at the association. They're aimed more at causation than at the association.

Q. Well, in what way do these studies show that cigarette smoking does not cause cardiovascular disease?

A. Well, of course, they don't prove that, but they -- in the MRFIT trial, M-R-F-I-T, some people call it MRFIT, a very large group of people were instructed and agreed to change their habits as regards diet and smoking, and then another control group was set up in parallel to the experimental group of people who went on in their usual way with their usual medical attention and no change, at least no orderly change in their eating and drinking habits and in their smoking habits, and the thing that was very discouraging about that trial was that when it was all over, there are very little differences in the results between the intervention group and the control group, and all of that tends to indicate that, although the

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associations are there, that changing one's smoking, eating and drinking habits may not have much effect on whether one dies or not.

So it was quite discouraging, because the persons who set it up had hoped for a considerable improvement in mortality and mortality from heart disease, and the results were very discouraging.

Q. Are there any other studies, sir, that in your opinion, support your opinion that cigarette smoking has not been proven to cause heart disease?

A. Well, there's another -- a couple of intervention trials that Dr. Rose carried out in England, which again had results of the sort I talked about in the MRFIT study. And in those studies, again, there was no improvement in the mortality of those individuals who changed their habits according to the intervention.

Q. Were they epidemiological studies, sir?

A. They were intervention studies.

Q. What's the difference between an intervention study and an epidemiological study?

A. Well, in an intervention study, one identifies the group of persons, and literally

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gets them to change their habits, that is, in this sort of intervention study, which is concerned with habits, and looks to see what the outcome is after a period of time.

As to whether this is called epidemiological or not, again, is a matter of definition. It's not the sort of study that is most generally considered epidemiological in the textbooks. On the other hand, it is certainly a study about disease in populations.

Q. Have you ever --

A. And going back to my original definition, if we're talking about a study of disease in populations, I would suppose that intervention study would qualify under that.

Q. Have you ever performed an intervention study, sir?

A. No, sir, I have not.

Q. Have you ever designed one?

A. I have not.

Q. Have you ever reviewed any intervention studies in terms of papers that you've written?

A. I've never written any reviews of intervention studies.

Q. Have you taught any courses which relate to

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intervention studies?

A. Well, relate to -- I have taught for a number of years back in the sixties a course on experimental design, which is literally the theory and practice of how to set up experiments, and the procedures that would be taught in that course would be among those that would be useful in setting up a randomized intervention trial. I've never set up such a trial.

Q. Have you ever been asked to be a consultant on such an intervention trial?

A. No, no.

Q. What text did you use to teach this course that you just described for us?

A. Experimental design? Oh my goodness, I know text by authors rather than by titles. This was a text which -- this was a course, excuse me, this was a course which was two semesters.

The first semester was in the mathematical theory of experimental design, mathematical and statistical theory of experimental design, and the second semester was in actual experimental designs, how to analyze them, and set them up.

And now with that explanation, in the

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first part of the course, I used a textbook by Graybell on linear models, I think, most of the time that I was teaching the course. Quite a common book back in the sixties.

And for the second semester, I think I used several different texts on the actual experimental design.

One semester, I used one by Oscar Kempthorn, who has a good book in this area. He was at the University of Iowa. Another semester -- another time I taught this course, I remember using a book by Davies, which is a British book on experimental design. And another time, I think maybe a couple of times I taught it, I used a textbook by Winer, which is a book on experimental design applied more in the social sciences.

MR. NORTHRIP: Off the record.

(Discussion off the record.)

A. Those are the texts that I remember using in that course. They're all standard texts.

Q. Are there standard texts in statistics that you used over the years?

A. Oh yes, there are many standard texts in statistics.

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Q. What are some of the standard texts that you've used in statistics over the years?

A. Do you mean in teaching courses, or in reference or how?

Q. Well, why don't you give me a half a dozen?

A. I'll give you a half a dozen --

Q. -- texts that you consider to be some of the better texts on the subject.

A. Certainly. Let me do that in two parts. Let me see if I can do that first in the theoretical area. Remember, I said statistics is sort of divided into two parts.

In mathematical statistics, some of the standard texts that I've referred to a lot are -- there's a text by Mood, which I used to teach out of back around 1960. There's a slightly lower level text by Freund. There is a very standard high level text by Wilks, which I never taught out of, but which I used for reference. There's a big two volume text on mathematical statistics by Kendall and Stewart, which I keep in my library, and that's something that you can use almost as an encyclopedia of theoretical statistics. I refer to that a lot.

There is a mathematical statistics

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book by Fisz, spelled F-i-s-z, a Polish gentleman, that had a considerable following at one point, it's a good solid text. There is a text, lower level, by a gentleman named Brunk, B-r-u-n-k, that I've used in courses.

Well, perhaps that's a long enough list. I'm sure there are lots of others in my library.

Q. What's operations research?

A. Should I do the applied list?

Q. Oh.

A. That was sort of the theoretical. I'm sorry, I'll try to make it a shorter list.

Q. Let's stick with the theoretical list. What's operations research, sir?

A. Operations research is a term that relates to the use of mathematical models for problem solving. Operations research has a very strong statistical component because in operations research, one is dealing with two kinds of models. In one, are the so-called deterministic models, which are models that don't make use of any notions of probability whatever.

The other so-called probablistic or stochastic models make use of probablistic and

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statistical ideas, concepts.

The work that I've done in relation to operations research has been on the probablistic side rather than on the deterministic side.

Q. My colleague tells me that it's more important for me to know the list regarding, what is it, practical --

A. Applied statistics.

Q. Applied statistics, yes.

A. Oh, well --

Q. So let me get that.

A. All right, let me see if I can dredge up some names for you. In applied statistics, I've used a text by Fryer, F-r-y-e-r. In teaching the basic statistics course to Wharton School sophomores, we used for years the text that John Decani and I wrote, and that's a fairly high level applied statistics course.

There is a very standard text by Netter and Wasserman that's gone through several editions.

Let's see, there is a good elementary text on the applied side by Chou, C-h-o-u. Perhaps we should cut it short at that point. Lots and lots of books.

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Q. Do you know Dr. Gould?

A. No.

Q. Have you used the phrase, significant statistical predictor?

A. It's a term I might use, yes.

Q. What does that mean, sir?

A. A predictor would refer to one of the independent variables in a regression equation, so could I have the term again? I missed one of the adjectives.

Q. Significant statistical predictor.

A. Any term in a regression equation that explains a significant proportion of the variance in the dependent variable would be a significant statistical predictor, provided that that proportion of the variance explained tests for significance by an F test.

Q. Sounds vaguely familiar, something Irwin Miller said.

A. Maybe I could -- do you want me to go on further with that?

Q. No, that's okay. It's been a long week. Let me ask you this, sir. Is cigarette smoking a significant statistical predictor for lung cancer?

A. Well, in the studies that I have done, we

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did not use cigarette smoking as a variable, so it simply wasn't included in those studies. Could you refer to some particular study that you're thinking of?

Q. I'm asking you for your opinion, sir, as to whether cigarette smoking is a significant statistical predictor.

A. Well, it depends entirely upon what study you're looking at, and in a particular study, it might or might not be. Overall, the question has no meaning.

Q. Why didn't you consider cigarette smoking in your study to determine whether or not it was a significant statistical predictor?

MR. DECKER: Objection, asked and answered.

A. Assuming that the question relates to the air pollution studies that we've been talking about --

Q. No, not to air pollution studies, to any other studies performed by you.

A. Well, I haven't done any other studies that relate to this case, but with that caveat, the reason was that we could not get data on cigarette smoking by standard metropolitan statistical area,

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and our work was based on those areas.

Q. Was --

A. We would have loved to have had smoking data on standard metropolitan statistical areas, and I continue to ask various persons if they know where to find some.

Q. Have you asked your friends over here?

A. Every hour on the hour.

Q. You ask these gentlemen over here?

A. They say they don't have it, but --

Q. That's what they tell me, too. Sir, what are antigens?

A. Antigens? Now you're getting way out of my area of expertise.

Q. We don't want to do that.

A. Antigens -- it's my understanding that, but I'm on very shaky ground here, it's my understanding that these refer to certain genes which turn on and bring about death from one or another cause; but I don't want to testify about antigens. I don't know much about antigens.

Q. Are there genetic differences between smokers and nonsmokers?

A. Genetic differences?

Q. Genetic.

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A. Between smokers and nonsmokers. I think that that is in the area of a hypothesis. I don't think that that is established one way or another.

Q. Have you read any papers in regard to whether there exist genetic differences between smokers and nonsmokers?

A. Genetic differences between smokers and nonsmokers? Let me think a moment. This gets -- thinking about that, I think there is some evidence from twin studies that there is some such difference.

Q. Are there genetic differences between people who get cancer and people who don't get cancer?

MR. TUCKER: I object to the form of the question.

MR. NORTHRIP: You're not specifying any type of cancer.

MR. EDELL: We can talk about lung cancer to start out with, if you'd like.

MR. NORTHRIP: It's your question.

A. I don't know.

Q. I'm sorry, sir?

A. I don't know.

MR. EDELL: I apologize for the use of a highlighted copy, but here is the document that

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I was referring to before, and could not find a clean copy, as they say in the business.

Mark that for identification.

(Exhibit Clelland 6 marked for identification.)

BY MR. EDELL:

Q. Can you tell us what the title that paper is, sir?

A. The paper is Ethological and Biochemical Interactions and Their Motivational Relationship to Smoking.

Q. What does that mean, sir, in lay terms?

A. Well, I'm not entirely sure. I think that could be interpreted in a number of ways, and I think I'd have to look at the article to answer that question.

I understand the meaning of the words in the title, but as to exactly what the whole title means in relation to the paper, I'm not terribly clear.

Q. You don't recall this paper?

A. Well, I have -- I -- I don't think I do.

Q. Let me ask you, do you recognize the handwriting on the paper, sir?

A. Master, something, no changes, deleted --

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maybe I ought to sort of --

Q. You can look through the whole paper if you'd like. First let me ask you, though, do you recognize the handwriting on the first page?

A. This deleted, no changes, master, no, I don't think I do. It's not my handwriting.

Q. Does it look like Dr. Hickey's handwriting, would you recognize his handwriting?

A. I don't know whether it's his handwriting or not.

Q. Does it look like his handwriting, sir?

A. I haven't seen any of his handwriting for quite a while.

Q. You just saw it for a good number of years, didn't you?

A. Yes. I really don't know whether that's his handwriting or not.

Q. Why don't you look through the rest of it and see whether that will clarify that for you.

A. And you're interested in the handwriting that's in the margins and so on.

Q. Yes, sir.

A. Well --

MR. NORTHRIP: There's some writing, it's not in the margins, but it's handwriting.

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MR. EDELL: My handwriting?

MR. NORTHRIP: I don't know. Somebody's. I think it was there probably when you got it.

MR. EDELL: I don't think I wrote on the document.

A. On this Page 7, looks like two different handwritings.

Q. Do either one of them look like Dr. Hickey's?

A. Gee, I don't know. Let's keep looking. I should --

(Pause.)

A. On the question of the handwriting, it doesn't -- my best opinion is that it doesn't look like Dr. Hickey's, but I'm not sure.

Q. Then let me ask you this question, sir, have you seen Dr. Hickey edit papers before?

A. Oh, we've exchanged lots and lots of edited papers.

Q. Does this look like editing performed by him?

A. The handwriting, my best opinion is that it does not look like his handwriting, but I'm not sure of that.

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Q. Do you recall reviewing this paper prior to today for Dr. Hickey?

A. I don't.

Q. Do you recall that this paper was, at least as edited by whoever did the editing on this, eventually published?

A. I don't know. To the best of my knowledge, I haven't seen this paper.

Q. Let me see if I can refresh your memory.

A. And I think I would have --

Q. -- remembered it?

A. Is this the -- is this a version of --

Q. Ethological and Biochemical Interactions --

A. Just a minute, this may be a version of something that's in -- where's my resume'? Where's my resume'? It's over here. That may be a version of a paper -- let's see -- let's look back here. Now wait a minute, there's a particular thing I'm looking for that I don't find. No, that symposium document isn't it.

As of now, I don't think I've seen this one before.

Q. Does it look like Dr. Harner's writing on there?

A. Looks more like hers than his, but I can't

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say whose writing it is.

Q. Did you ever see the publication, Smoking Behavior: Motives and Incentives?

A. William Dunn, Editor.

(Document handed to the witness.)

A. Oh, so that's what it is. No, I have never seen that book, I really haven't.

Q. Okay, I believe you.

A. I've never seen that book.

Q. There is an expression of their appreciation to, among others, you and Dr. Seltzer for constructive criticism with regard to the paper.

Do you recall reading this paper, sir?

A. I don't. Maybe I've seen it, but I don't recall it.

Q. Do you recall Dr. Seltzer participating in this paper at all?

A. No, I don't have any remembrance of this paper. It's in, what, 1972? All I can say is if I reviewed this, it certainly isn't my writing on it, and I don't have any memory of it at all. It's not in my resume'.

Q. What does ethological mean, sir?

A. Ethology is a branch of science which relates to behavioral factors and biological

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factors. Again, this is an area in which I'm not an expert.

Q. Is Dr. Hickey an expert in this area?

A. I believe he has some expertise in the area.

Q. Were you aware that he was given a grant from the Council for Tobacco Research to do research in this area?

A. If there is a proposal which -- a proposal to the Council for Tobacco Research which has my name on it, I was certainly aware of it when that was submitted. I don't have any particular recollection of that particular event.

Q. What expertise are you aware of that Dr. Hickey has concerning ethological and biochemical interactions and their relationship to smoking?

A. Well, Dr. Hickey is trained in chemistry, and I believe in biology, and has done a great deal of reading and work in those areas.

Q. Were you aware that Dr. Hickey performed other work other than the work that you did with him for the Council for Tobacco Research and/or the cigarette manufacturers?

A. Let me think. I believe that at the present time, he is doing something for one of those organizations. I'm not aware of anything he did

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for the Council for Tobacco Research or other parts of the tobacco industry prior to his retirement, when these projects ceased. He may have done that, but I don't know about it.

Q. What is genotype, sir, what does that mean?

A. Genotype, again, you're getting very deeply into biology here.

It's my understanding that genotype is a term that is used by biologists in contrast to the other term, phenotype, genotype, relating to the transmission of characteristics through the gene and phenotype, relating to their expression in the whole human or animal.

I am very -- I am very unwilling to become any sort of authority on such matters.

Q. Have you ever done any work with regard to the hypothesis that an individual genotype influences the development of lung cancer?

A. This is one statement of the so-called constitutional hypothesis, and I had been aware of that hypothesis for many years, and have always considered it as an alternative to the other hypothesis that's very prominent, namely, that tobacco smoking causes lung cancer. So I've been aware of constitutional hypotheses for a long

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time, but I've never done any specific biological work on them, obviously.

Q. Have you done any epidemiological work on that subject.

Q. Well, the subject that we're talking about here is --

Q. Genotype?

A. Genotype as relates to smoking?

Q. As relates to lung cancer.

A. As relates to lung cancer. Not directly. The only thing I've done that relates to that at all is in the -- in connection with the air pollution studies. I and others on the project were interested in other possible causes of lung cancer besides air pollution, and the constitutional hypothesis which suggests that it's various characteristics of the individual that is perhaps largely or perhaps to some extent responsible for lung cancer.

That is something we always were very interested in.

MR. EDELL: Thank you. Cross examination, gentlemen?

MR. TUCKER: I've got a couple of hours.

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MR. DECKER: No questions.

MR. EDELL: Just so we're clear, Mr. Northrip, there are no other opinions that you intend to elicit from this witness at trial, so we're not surprised.

MR. NORTHRIP: That's not our intention to have him testify to any opinions that are not covered in his expert report or any other materials that we have given you or what you have covered today. I trust the same would be true for your witnesses.

MR. EDELL: As always.

MR. NORTHRIP: I plan to object if you present any. I assume you will do so if I try to.

(Deposition adjourned at 4:35 p.m.)

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C E R T I F I C A T E

I, Kathleen A. Paglione, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, do hereby certify that prior to the commencement of the examination, the witness and/or witnesses were sworn by me to testify to the truth and nothing but the truth.

I do further certify that the foregoing is a true and accurate computer-aided transcript of the testimony as taken stenographically by and before me at the time, place and on the date hereinbefore set forth.

I do further certify that I am neither of counsel nor attorney for any party in this action that I am not interested in the event nor outcome of this litigation.

Kathleen A. Paglione CSR.
Certified Shorthand Reporter
X100449
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